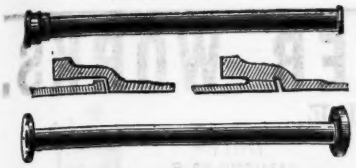
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXVII. No. 1708.] LONDON, FEBRUARY 4, 1896. [48TH YEAR. PRICE 6d.

GAS AND WATER PIPES
1½ to 12 IN. BORE.



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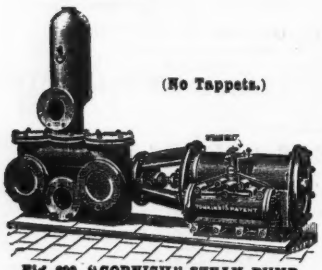

Fig. 600. "CORNISH" STEAM-PUMP FOR WATER.

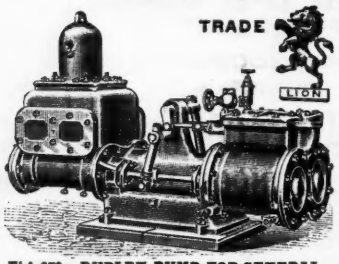

Fig. 670. DUPLEX PUMP FOR GENERAL PURPOSES.

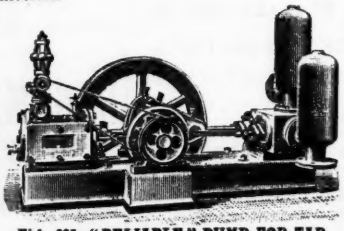

Fig. 685. "RELIABLE" PUMP FOR TAR AND THICK FLUIDS.

Fig. 703. SINGLE RAM PUMP FOR BOILER FEEDING, &c.

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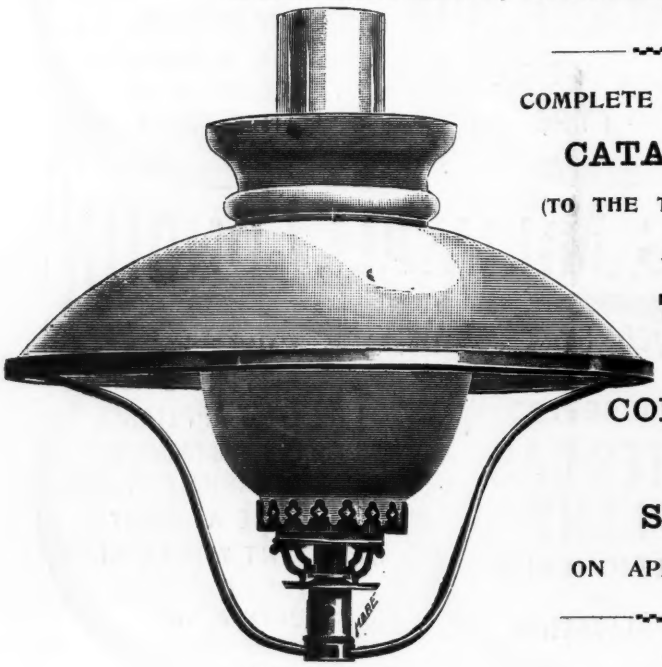

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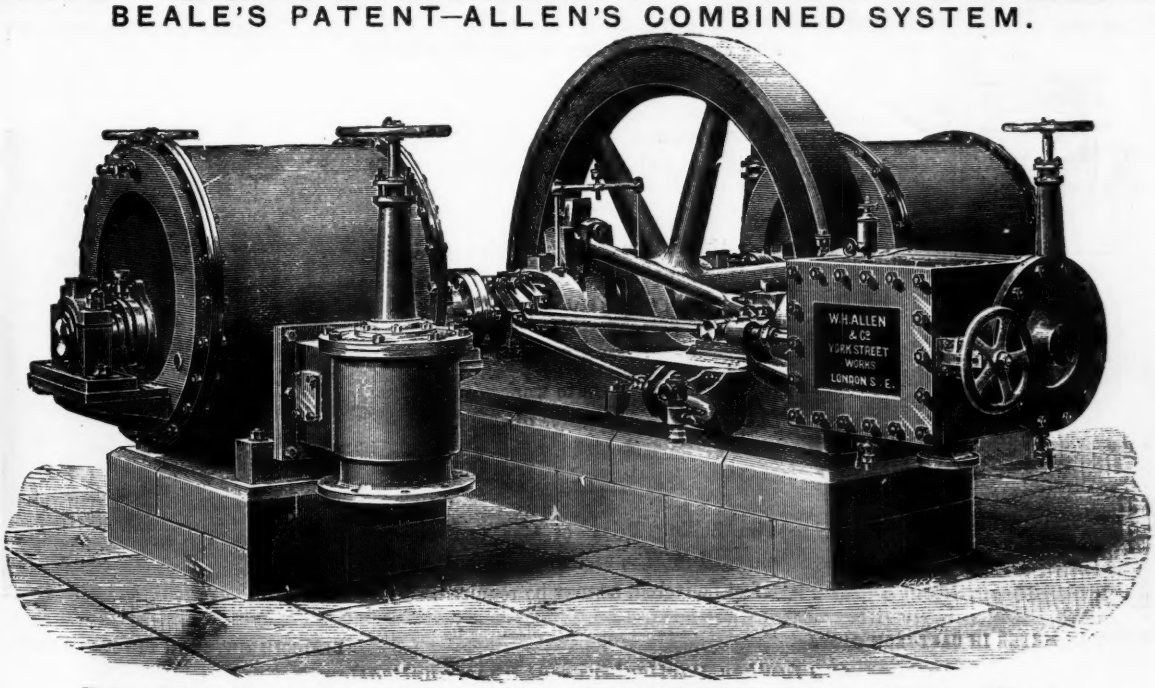

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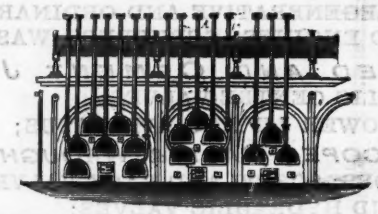

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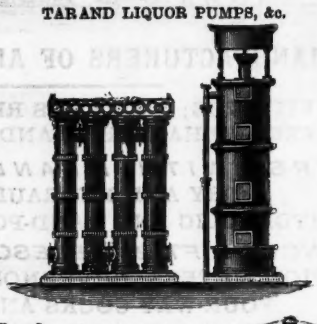

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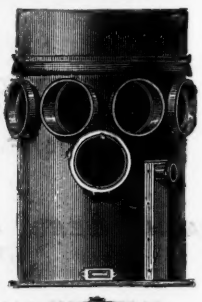

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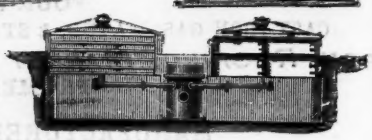

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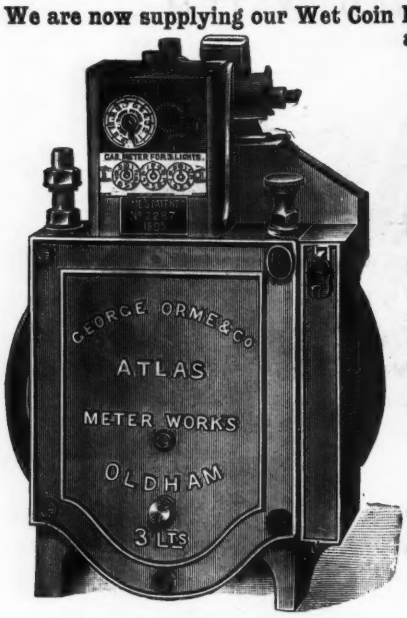

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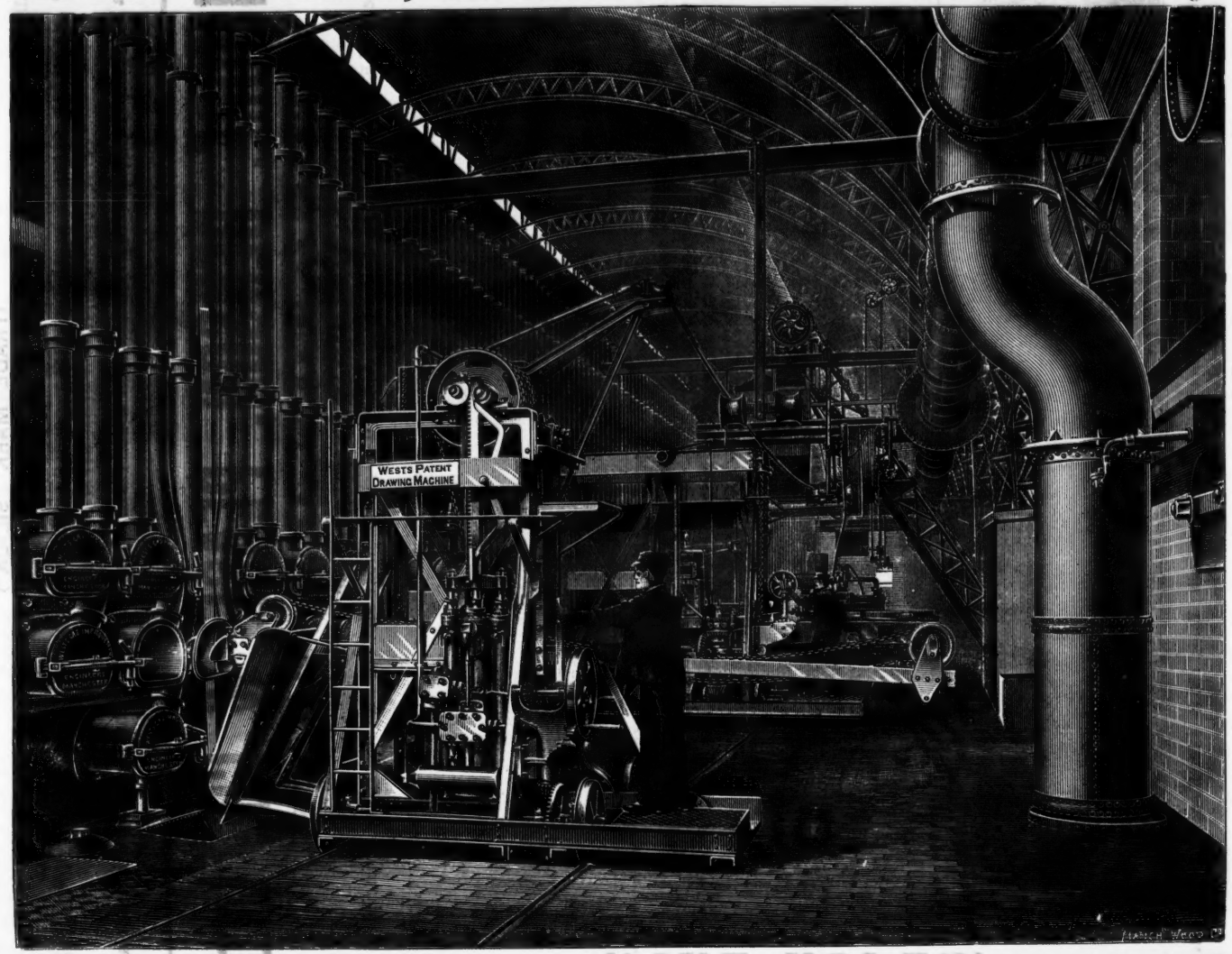

Interior of Retort-House at the Bradford Road Gas-Works, Manchester, showing the Compressed-Air Drawing and Charging Machines.

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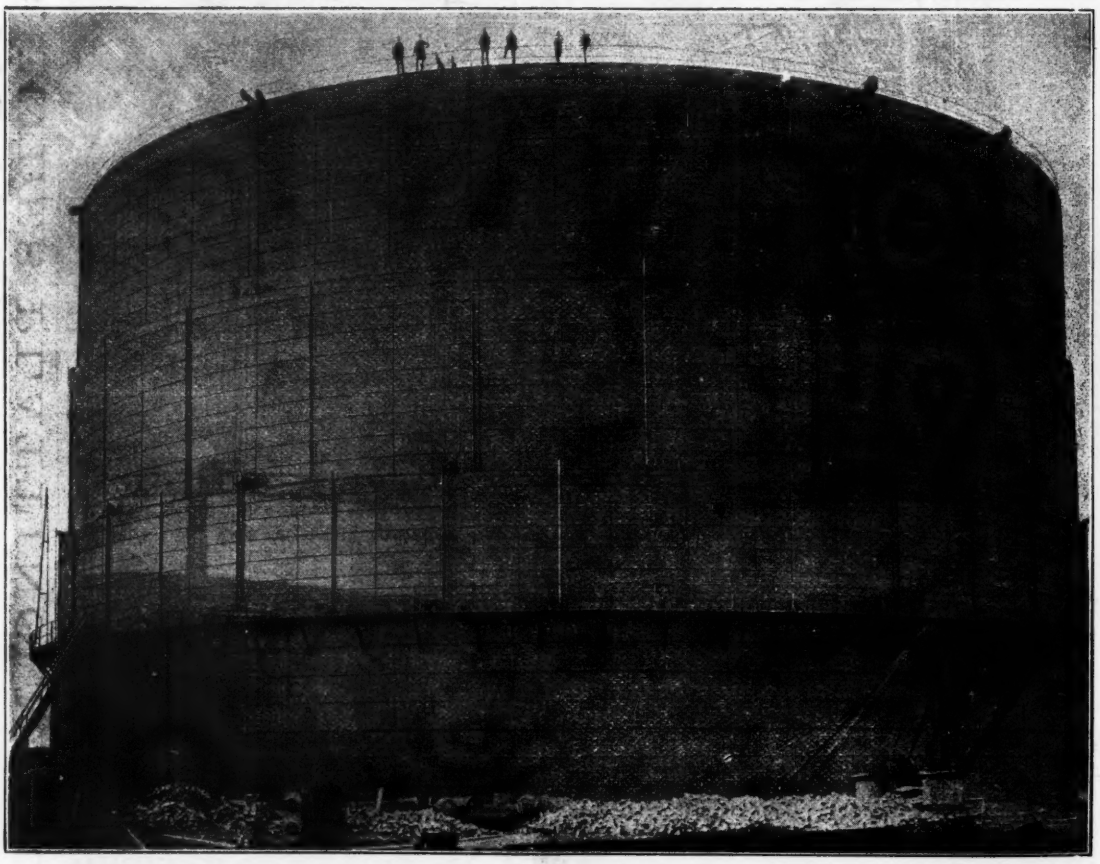

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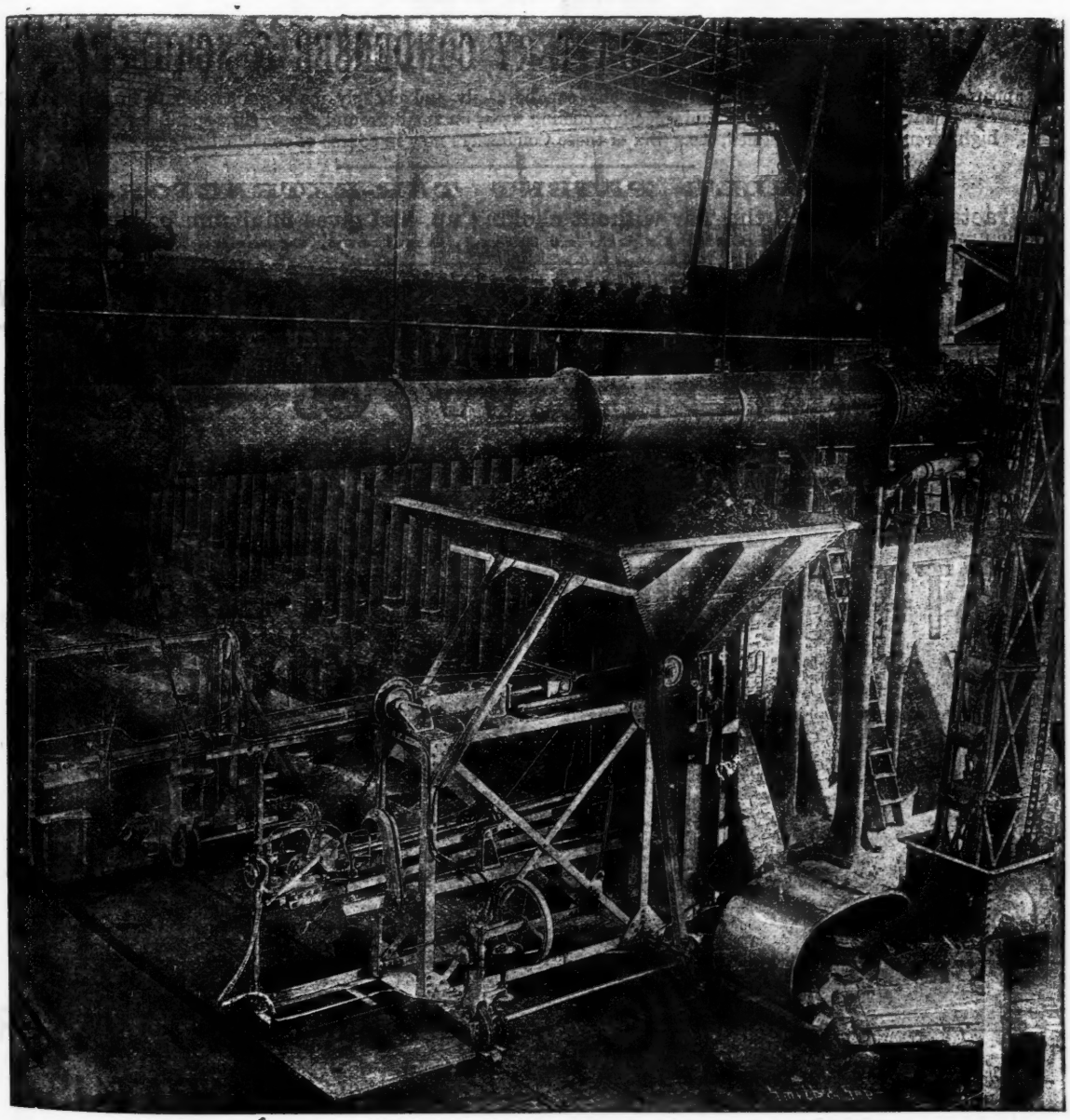

The above engraving shows the interior of a Retort-House at the Tradeston Gas-Works, Glasgow, where the Machines have been at work since the beginning of 1893, drawing and charging **960 Retorts every 24 hours. 79 Drawing-Machines and 52 Charging-Machines are at work, or in course of construction.**

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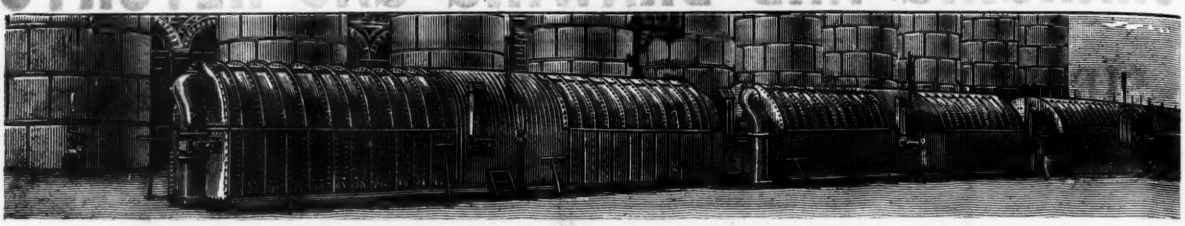

View of SIX PATENT "STANDARD" WASHER-SCRUBBERS, erected at the Beckton Station of The Gaslight and Coke Company (the Engines driving same being under Galvanized Iron Covers). This Company have 30 of these Machines in use. They are also in operation at a great number of Gas and other Works in this Country and Abroad.

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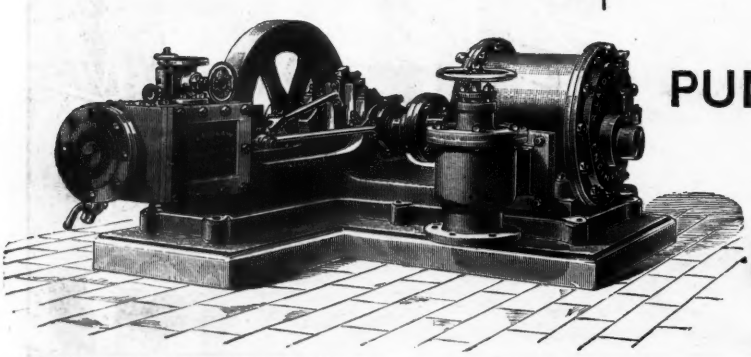

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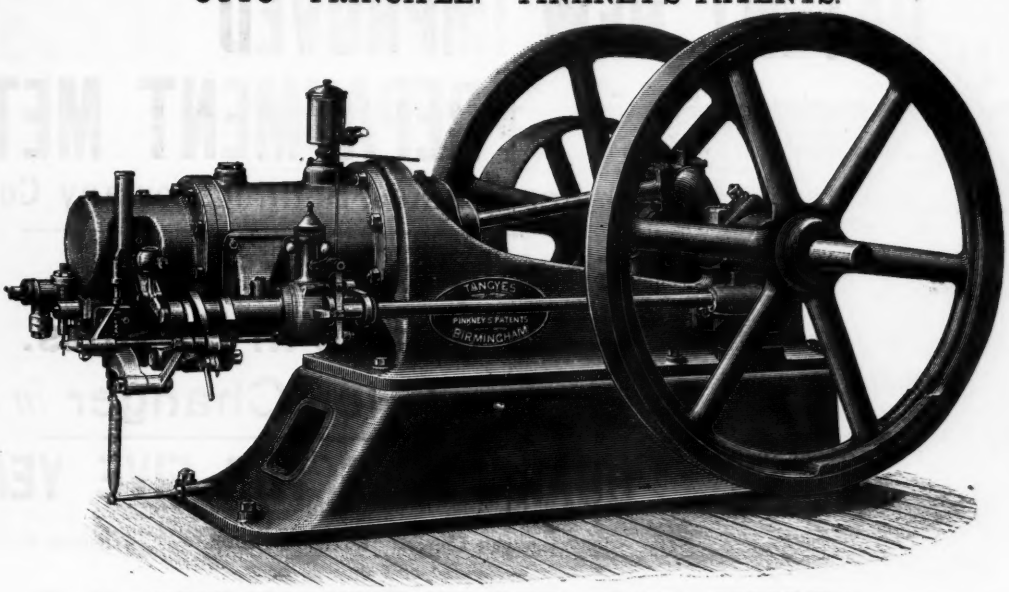

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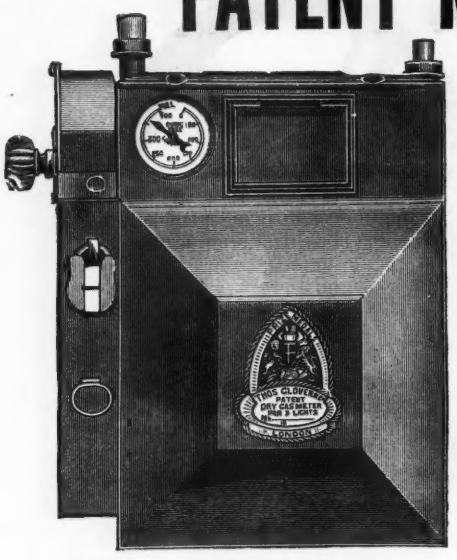

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CONTENTS.

EDITORIAL NOTES:—

GAS, LIGHTING, &c.— PAGE

The Chartered Report and Accounts 215
The South Metropolitan Report and Accounts 216
Dibdin and Methven on the Ten-Candle Standard 216
Town Councillors' Right of Voting 217

WATER AND SANITARY AFFAIRS—

The London County Council and the Metropolitan Water Question 218

ESSAYS, COMMENTARIES, AND REVIEWS:—

Gas and Water Companies in the Stock Market 219
Electric Lighting Memoranda. 219
Water Bills for 1896. 220

NOTES:—

Dr. Armstrong on the Luminosity of Flames 221
A Bisulphide of Carbon Motor 221
The Metric System and Screw Threads. 221
The Reproduction of Tracings by Photography 222
The Electrolysis of Gas-Mains 222

TECHNICAL RECORD:—

The Standard of Light—Paper by Mr. W. J. Dibdin, F.I.C., F.C.S., at the Society of Arts. 222
Public Lighting by Incandescent Gas-Burners 227
Recent Developments in Gas-Engines 227

REGISTER OF PATENTS:—

Testing Gas and Other Pipes—Purves, D., and Morton, R.. . . . 228
Gas-Engines—Binns, J. P. and H. G. 228
Producing Acetylene Gas—Lake, H. H. (Dickerson, E. N.). . . . 228
Supplying Acetylene Gas—Lake, H. H. (Dickerson, E. N.). . . . 229
Obtaining Cyanides from Gases—Foulis, W., and Holmes, P. F. . 229
Sun-Light Gas-Burners—Thomas, W. J. 230
Gas-Engines—White, C., and Middleton, A. R. 230
Liquid Meter, Motor, or Pump—Bernays, J. 230
Intermittent Gas-Lights—Rickman, W. B.. 230
Gas-Engine—Wise, W. L. (The Buckeye Manufacturing Company) 230
Patent Notices 230

CORRESPONDENCE:—

Selling *v.* Holding Stocks of Sulphate of Ammonia 231
The Relative Prices of Crude Naphtha and Benzols 231
The Municipal Water Supply of Cologne 231
Obtaining Receipts from Workpeople for Wages 231

LEGAL INTELLIGENCE:—

High Court of Justice—Queen's Bench Division—The Incandescent Gas-Light Company's Patents 231
Personal Injuries Caused through Main-Laying Operations—Remarkable Coincidence 231
The Litigation between the Dublin Corporation and the Gas Company 232
Abstracting Money from Automatic Prepayment Meters . . . 232
South Staffordshire Water Company's Charges in Burton . . . 232
A Disputed Water Account 232

MISCELLANEOUS:—

Gaslight and Coke Company—Half-Yearly Report and Accounts . 233
South Metropolitan Gas Company—The Half-Yearly Report and Accounts 233
Presentation to Mr. J. W. Helps 234
Cheltenham Gas Company—The New Bill; Issue of Additional Capital; The Proposed Railway 234
The Dublin Corporation Bill—The Gas and Water Provisions . 234
Explosion at the Hyde Gas-Works—The Governor-House Damaged 237
Electricity *v.* Gas at Preston 237
Leicester Gas and Electricity Supplies—A Gratifying Growth of Business 237
The Teignmouth Gas Undertaking 237
The Fatality at the Hampstead Electric Lighting Station . . . 237
Metropolis Water Supply—The London County Council and the Water Question 238
Extensions at the Warwick Water-Works 238
The New River Company's Proposed Additional Works and the Water Supply of Hertfordshire 239
The Proposed Auxiliary Water Supply for Nottingham—Action by Newark 239
The New Water Supply for Swansea 239
Notes from Scotland. 240
Current Sales of Gas Products 241
Coal Trade Reports. 241
Gas and Water Companies' Stock and Share List 241

PARAGRAPHS:—

PERSONAL: Mr. B. Leigh Smith; Mr. A. Slaughter; Mr. E. K. Harvey, J.P.; Mr. W. T. Sugg; Mr. C. T. Lucas; Mr. J. R. Wigham; Mr. Herbert Canning; Lord Rayleigh; Mr. G. E. Stevenson; Mr. George Warner 217
OBITUARY: Mr. D. K. Clark, M.Inst.C.E.; Mr. G. P. Bidder, Q.C. 218
Received—Professor Boyd Dawkins on Our Coal Supply—The Effect of the Use of Gas-Stoves on the Coal-Carrying Trade—Acetylene as an Illuminating Agent—The Official Audit of the Metropolitan Gas Companies' Accounts 218
Centenary of the Completion of the Soho Foundry, Birmingham . 219
Proposed International Exhibition in Brussels in 1897—The Zeitschrift für Beleuchtungswesen—The Provisional Order Applications for the Coming Session—Institution of Mechanical Engineers—Combustion of Coal and Gas in House Fires 221
Weardale and Shildon District Water Company 230
Calverley and Horsforth Gas Company—The Leeds Corporation and the Gas Workers' Union—Chester United Gas Company—The Reinstatement of Public Roads 232
The Tynemouth Gas-Works Disaster 234
Fylde Water-Works Purchase Question—Newcastle and Gateshead Gas Bill 238
Remarkable Offer to the Cardiff Corporation Lighting Committee 239
Malvern Link Water Bill—Electric Lighting and Dust-Destruction Schemes—Finding Water by "Divination"—Gas and Electric Lighting at St. Austell 240
The Administration of the Hull Corporation Water Department . 241
Leakage of the New Reservoir at Redruth—The Severn Conservators and the London Water Supply—Sales of Shares 242
South Staffordshire Water Company—Durham Gas Company—Proposed Extension of the Newark Water Supply—Kendal Corporation Gas Supply—Water Supply in the Berlin Out-Townships—Gas-Engines for Pumping Water at Ashbourne—The London County Council and Projected Electric Lighting Schemes for South London—Electric Lighting at Hull 243

EDITORIAL NOTES.

The Chartered Company's Report and Accounts.

THE report of the Directors and the statement of accounts relating to the last half-year's working of The Gaslight and Coke Company will be found in another part of the present issue of the "JOURNAL;" the ordinary general meeting being called for Friday next. What many people regard as the most important figures dealt with in the report and accounts have already been published, in the notification, issued as usual by the Secretary and General Manager (Mr. J. W. Field), that it is proposed to declare a dividend for the past half year after the rate of 12¾ per cent. per annum, carrying forward the sum of £164,121. The profit balance for the half year amounts to £524,091, as compared with £594,049 for the latter half of 1894, when £255,254 was carried forward. The prices of gas for this period were 3s., 2s. 10d., and 2s. 4d. per 1000 cubic feet; and the rate of dividend paid was 12 per cent. Meter-rents were also charged. In the present accounts, the prices of gas are 2s. 10d. and 2s. 3d. per 1000 cubic feet; and there is no revenue from meter-rents. The reduction in the price of gas and the abolition of meter-rents would together stand for about £110,000 of diminished revenue in the half year.

The report states that the sale of gas has again been satisfactory; the total increase in the consumption being 4·86 per cent. of the quantity sold for the corresponding half of the previous year. There has been an increase of 2·28 per cent. in the consumption by what are called "automatic meter customers." By the way, is there any extra charge, in the form of dearer gas, to this class of consumers? If so, is not this a kind of meter-rent, which differs from the old impost in being levied on the smallest consumers? The report states that the capital expenditure necessitated by the development of the Company's business was provided for by the issue in December of £100,000 ordinary "A" stock, all of which was placed at or above the reserve price of £292 per cent. The fourth paragraph of the report, which treats of the Company's business in residuals, is the one most likely to arouse criticism on the part of those followers of the fortunes of the undertaking, whether proprietors or not, who regard other things besides dividend rates as indicating the condition of affairs.

This paragraph states that "the prices realized during "the half year by the sale of coke and tar products may "be considered, on the whole, favourable." What does this mean to imply, if not that the trade in coke has been fairly satisfactory? Those who happen to be acquainted with the facts of the trade may well rub their eyes and ask themselves if they are not hypnotized when they see this calm statement. Turning to the revenue account, it will be found that the sum received for the coke sold at these "favourable" prices is £21,852 less than the corresponding entry of a year ago. Further research into the supplementary "Statement of Residual Products" throws some light upon the mystery. The stock of coke at the end of the year was no less than 136,198 tons, just treble the bulk of that in store a twelvemonth ago. And this notwithstanding the disposal during the half year of 33,678 tons more, for £21,852 less money! If this is good trade, it ought never to be necessary for any trader to complain. Uncritical. as a general rule, as the Horse-ferry Road audience is, it will be remarkable if so odd a basis as the above is accepted as justifying so optimistic a report. It is a similar case with tar products, which stand for £10,000 less in the revenue account; while the stock has grown hugely. Yet in the general balance-sheet the store of coke is valued at £55,902, as against £26,700 at the end of 1894; and tar and ammoniacal liquor and products stands at £264,013, as compared with £189,924. If the prices realized were so favourable, why were not more of these valuable commodities turned into cash? Then there is sulphate. The story of this maltreated article is confessed in the report to be one of continued depression. In point of fact, it returned the Company in the past half year £53,097, as compared with £60,027 a year ago; and there is nothing in the accounts to show how much was sold or how much remains in store. At the last meeting, the Governor (Colonel W. T. Makins) took credit to the Board for their policy of accumulating stocks of sulphate against better times. Is he quite satisfied with

the result of the operation of this policy, as shown in the downfall and hopelessness of the sulphate market? This matter is beyond joking, even in the mild form that serves to entertain the Horseferry Road meetings every half year. Sulphate as a commodity has been ruined—those who ought to know say by the producers who have accumulated stocks. The record is upon our pages for all to see and form their own opinion upon. The more cynical might regard it as unfortunate that the stuff is incapable of spontaneous combustion. If the contents of the Beckton stores would take themselves off in some such way, the insurance fund of the Company would suffer temporary depletion; but the relief to the system would be great. This is, however, not the way to discuss such an evil, which has its roots in the character of the Company's administration. Unless this is improved, the undertaking will continue to exhibit these aberrations from the standard of commercial efficiency which can be deduced from the conduct of other concerns of the kind. For this reason, and notwithstanding the increased dividend paid, and the high value put upon the Company's stock, we are fain to confess that rarely has a Chartered report or set of accounts given so melancholy a study as those now in question. The gas business is all right, of course. The Board could not spoil this, if they tried, so long as people want more and more gas for various purposes as years go by, and the admirable staff continue to do their duty in their accustomed style. The property is safe, equally of course; because it does not depend for security upon the shifting and unknown quantity of directorial and managerial capacity. It is precisely in those branches of the business which are not protected that the Chartered Company habitually suffers; and now that the report has gone the length of trying to put what seems very like a false gloss upon the returns of these departments, true friends of the Company and the gas industry might be excused for feeling downhearted about it.

The South Metropolitan Report and Accounts.

THE report of the Directors of the South Metropolitan Gas Company and the statement of accounts relating to the past half-year's working of the undertaking appear in another part of our columns. They are of more than average interest, for several reasons. The parliamentary programme of the Company, which will be considered at a Wharncliffe meeting to follow the ordinary general meeting to-morrow week, is not mentioned in the report, as it will form the subject of special notice. Without this extraordinary matter the report is long, and deals with a variety of important topics arising from the general operations of the Company. The order of these subjects is peculiar; the recommendation for the payment of a nominal 13 per cent. dividend, and adding another ¾ per cent. to the reserve, coming almost last instead of standing at the top as the principal thing to be considered. The first subject mentioned is the price of coal, which was bought at an average reduction of 6d. per ton; and the report proceeds to state that this saving has been much more than absorbed by the fall in the value of coke and sulphate of ammonia. This paragraph is a very strongly worded one, and cannot be read without reflecting upon the fashion in which the same topics are dealt with elsewhere. Though the Directors complain of their coke returns, these amounted to £99,666, as compared with £107,668 for the corresponding half of 1894—a period when, by their own showing, the value of coke was inflated. Of course, there was more sold for the money. The remainder in stock at the end of the year was 25,850 tons, which is not so very heavy a store as might have been expected, seeing the insuperable difficulty the Company's bigger neighbour had in getting rid of their output. As regards sulphate, the Directors complain that they ought to have made £14,000 more of this residual than they were able to obtain; but, they remark, "fortunately "the Company has no stock of sulphate, which always "tends to depress the market—the system adopted being "to sell as it is made."

On the other hand, as the report admits, there is the consolation that the sale of gas shows an increase of 7·88 per cent., which is very large indeed for such a half year as that just ended, with no climatic conditions to force up the demand. Here again the Directors take the shareholders into their confidence by assuring them that the increase of business is accompanied by economies in working "due to the increased use of machinery and the "willingness of the men to work it." Reference to the revenue account shows that the carbonizing wages have been brought down to the low rate of 2s. 4·68d. per ton. Again, the report shows that the cost of capital to the consumer—the amount per 1000 cubic feet of gas sold required to pay the dividend and interest on borrowed money—is diminishing at both ends. Capital can be more cheaply raised, and it goes farther in gas-producing power. These reductions have amounted to 3½d. per 1000 cubic feet in the last ten years. "In 1885, 1s. 1½d. per 1000 "cubic feet sold was required to pay interest on debenture "stock and a 12½ per cent. dividend; whereas 10d. only "is now required to pay debenture interest and a 13 per "cent. dividend." These two paragraphs contain an epitome of the causes that have operated to place the Company in its present position, with gas selling at 2s. 3d. per 1000 cubic feet.

With respect to the popularity of automatic prepayment meters in the South Metropolitan district, it is little short of marvellous that the Company had actually 42,949 of these friends of the poor householder in operation by the close of the year; being an increase of 10,616 for the half year. With these were also fixed 8731 small gas cooking-stoves; making in all 29,548 appliances of the kind—absolutely a number in excess of that of the ordinary gas-stoves. Under such conditions, a constant outlay of fresh capital becomes imperative; and accordingly, £136,350 has been laid out on extensions during the past year. The business done, however, has "expanded in a much greater proportion," as the report puts it, which is proved by the fact that the capital per ton has been reduced from £4 11s. 9d. in 1894, to £4 5s. 6d. in 1895. Lastly, to wind up a remarkable tale of progress and prosperity, the Directors "express "their appreciation of the exertions of their officers and "foremen to promote the interest of the Company, and "the loyal and cheerful spirit in which the workmen per-"form their duties." The amount invested in the ordinary stock of the Company by the employees is now £25,624, besides £33,227 of accumulated bonuses and savings on deposit.

There is plenty in this report, and in the accounts, for the Chairman (Mr. George Livesey) to talk about to-morrow week, if he has the time. But, in view of the other business that must be done on the same day, he can hardly be expected to do more than explain at some further length the remarks on the subject of the residuals markets, which stimulate rather than satisfy curiosity. The gas residuals produced in London are enough to control the trade, if only the sales were properly managed.

Dibdin and Methven on the Ten-Candle Standard.

MR. W. J. DIBDIN had an opportunity last Wednesday of continuing before the Society of Arts the story about the standards of light and gas testing which he commenced in a paper read in the same place so long ago as Dec. 2, 1888. Seven years have elapsed between the readings of these papers; and though the time has not been fruitless as regards investigation and criticism, it is a fact, as Mr. Dibdin observed, that the candle remains in its old position. In 1888, the author could state that there was a consensus of expert opinion on the desirability of doing something in the direction of improving the parliamentary standard of light; and now it is possible to carry the argument a step farther, by showing that the Board of Trade Committee have decided what the substitute for the candle should be. There is not a great deal that is new to readers of the "JOURNAL" in Mr. Dibdin's paper; but to give something new was not the author's intention. It must be remembered that the report of the Board of Trade Committee had not been publicly discussed till Wednesday; and it is a good feature of the paper that, writing as he has done at a considerable interval after the promulgation of the report in question, Mr. Dibdin has not found it necessary to qualify its conclusions in any way. On the contrary, he has strengthened them in one highly important respect, by bringing forward some fresh material in support of the proposition that the source of light to be used as a standard must be produced by the process of combustion. He shows that nothing more has been attempted of late in the direction of producing a standard of light depending upon the incandescence of a solid body; and also that the incandescent electric lamp is quite unsuitable for such a purpose. Mr. Dibdin, while approving generally of the conclusions of the Board of Trade Committee, regrets

that the recommendation as to the way in which gas should be burnt for photometrical purposes was included in the report, because it upsets in effect "the existing "bargain between the Gas Companies and the public, as "repeatedly sanctioned by Parliament." He declares also that "the Committee afford no evidence of an experi- "mental character to warrant the further change thus "proposed." We cannot think the prospects of the pentane 10-candle standard improved by the proposal of another form of it by Mr. A. G. Vernon Harcourt, which Mr. Dibdin felt bound to introduce to the meeting.

When speaking upon the paper, Mr. Vernon Harcourt expressed approval of the subject-matter of the recommendation of the Committee, while questioning the wisdom of its inclusion in the report; and he offered some valuable observations upon this and kindred questions. Mr. John Methven, on the other hand, made the most damaging speech on the proposed 10-candle standard that has yet been addressed to the subject of the merits of this pentane arrangement. He declared that, having had half-a-dozen operators at work upon it during the last few months, he has found, as the result of the average of 500 tests, that the illuminating power of the so-called 10-candle standard is really 10·283 candles—that is to say, it is nearly 3 per cent. over the rated value. This would mean that, as measured by such a standard, it would take 16½-candle gas to show 16 candles in the photometer. This is enough to make the Gas Companies think twice before accepting the Dibdin apparatus as a substitute for the standard candle. The question arises how, if Mr. Methven is right, the Committee can have made such a mistake. A difference of 3 per cent. in the value of a 10-candle standard could hardly escape detection. Yet another speaker—Mr. Grafton—is reported as saying that he had conducted about 3000 experiments with the Dibdin standard, and could not get it to average 10 candles. Mr. Dibdin appeared to warmly resent the impeachment of the accuracy of his standard; but, after what Mr. Methven has stated, the Gas Companies will decline to be "rushed" in the matter to please the London County Council and Mr. Dibdin. We give the latter credit for perfect sincerity in stating his 10-candle standard to be of the value its name implies. But there are those behind and above him whose behaviour to the Gas Companies in the past justifies the suspicion that they would think it a fine thing to "do" the Companies to the extent of 3 per cent. of illuminating power. If Mr. Lacey is correctly reported as having told the meeting that it was not necessary to discuss the precise equivalent of the Dibdin standard in candles, the great thing being to get a definite and invariable standard, he may have deserved the thanks which Mr. Dibdin tendered to him in replying upon the discussion; but the gas industry have no reason to be grateful for the remark. The Gas Companies do not want any favour in the matter of the standard of light; but when they are offered a 10-candle standard, they have a right to be satisfied there is no deception in the figure.

Mr. Methven, to whose labours in this field the gas industry already owes so much, has as good a claim to the confidence of Gas Companies and the technical public as Mr. Dibdin—we will not say that he has more. The doubts now thrown upon the real value of the 10-candle standard—which the Companies had no disinclination to accept—must be removed before anything else is done in the matter of photometrical reform. We venture to suggest that an independent Committee of three men of science who have not been mixed up with the business hitherto—say, Lord Rayleigh, Captain Abney, and Professor Crookes—should be asked to look into the question as it stands. At the same time, as the details of the photometrical apparatus exercise such an important influence upon the results of testing, they might settle the elements of a standard photometrical installation as a preliminary to the conduct of their own investigations and a pattern for the rest. Everybody must be weary of hearing photometrical experts, like Mr. Dibdin and Mr. Methven, throwing discordant readings at one another, only to be explained by references to "heated boxes," rooms not built for the purpose, insufficient ventilation, and so forth. There can be no finality about photometrical controversies so long as so many undetermined elements come into play. Therefore, instead of waiting, as Mr. Dibdin says the Gas Referees are doing, for the settlement of the standard before prescribing the photometer, it seems that the photometer will have to be prescribed before the standard can be settled.

Town Councillors' Right of Voting.

THE question of the right of members of local authorities who may be interested as shareholders in a local gas company to vote upon motions respecting electric lighting was lately made the subject of a remarkable ruling by the Mayor of Colchester, acting by the advice of the Town Clerk. The circumstances will be found fully set out in our "Electric Lighting Notes" on the 21st ult. The Lighting Committee of the Town Council made certain recommendations to the Council in special meeting; and before the vote upon the resolutions was taken, the Town Clerk declared that "shareholders in the Gas Company were not "in a position to vote on the question, nor were gentlemen "interested as owners of private electric lighting installa- "tions." This pronouncement appears to have been made upon the authority of yet another Counsel who had been asked for his opinion on the point; and the Town Clerk said that he "unhesitatingly" thought the same. It strikes an impartial observer that it is high time the question was carried into Court, and finally settled; for at this rate there will soon be so many members of local authorities barred from taking part in important discussions and divisions, as to seriously jeopardize the efficiency of these bodies. The much-quoted Act says that members of local authorities must not in certain circumstances vote on some resolutions. The Mayor of Colchester goes a long way farther, and says they must not "speak, act, or vote." Where is the line of "interest" to be drawn, if a town councillor is debarred from voting upon an electric lighting question by reason of his having a private electric lighting installation in his house, to say nothing of possessing a gas share or two in his safe? This thing is becoming ridiculous. As well might a millionaire member of the House of Commons have been debarred from voting upon the late Chancellor of the Exchequer's revised death duties, for fear lest he might be prejudiced by regard for his heir's interest in the same matter. It could be wished that some Town Council attainted in this absurd way would set the opinions of Counsel at defiance, and take the consequences. We should then know how the law really stands; and there would be a possibility of getting it altered if found to be too preposterously out of accord with the state of public opinion.

PERSONAL.

Mr. B. LEIGH SMITH has resigned his seat on the Board of the South Metropolitan Gas Company.

Mr. A. SLAUGHTER has been elected a Director of the Steyning Gas Company, in place of his deceased father.

Mr. E. K. HARVEY, J.P., has defrayed the cost of installing St. Peter's Church, Kirkley, with incandescent gas lighting.

Mr. W. T. SUGG was last night awarded the Society of Engineers' premium for his paper, read last session, on "Ventilation and Warming."

The will of the late Mr. C. T. LUCAS, of the firm of Messrs. Lucas and Aird, has been proved; the gross value of the personalty being sworn at £312,078, and the net value at £291,963.

Mr. J. R. WIGHAM, the President of the Dublin Chamber of Commerce, who is well known to our readers for his work in connection with the employment of gas for lighthouse illumination, has been elected Chairman of the Blackrock Township Commissioners.

Mr. HERBERT CANNING (son of Mr. Thomas Canning, Assoc. M.Inst.C.E., J.P., the Engineer and Manager of the Newport Gas Company) has obtained the Town Gold Medal at the Technical and Art Schools at Newport, for the highest record in science since the opening of the schools.

Lord RAYLEIGH has accepted the appointment of Scientific Adviser to the Trinity House, which has been revived after being in abeyance since the resignation of the late Professor Tyndall, under circumstances which will be in the recollection of many of our readers. The post was formerly held by Professor Faraday.

Mr. G. E. STEVENSON, M.Inst.C.E., Manager of the Rochdale Road Gas-Works of the Manchester Corporation, will probably shortly have his responsibilities increased. A resolution of the Gas Committee that he should be appointed Consulting Gas Engineer to the Corporation, at an increased salary, will come before the Council to-morrow for confirmation.

Mr. GEORGE WARNER, eldest son of Mr. W. J. Warner, the Engineer and Manager of the South Shields Gas Company, was retained last week, in association with Mr. S. Pope, Q.C., and Mr. S. H. Day, on behalf of Mr. W. T. Doxford, the Conservative M.P. for Sunderland, in the proceedings taken by the defeated Liberal candidate (Mr. F. G. Storey) to nullify his return. The petitioner failed in his application.

WATER AND SANITARY AFFAIRS.

THE *rapprochement* between the Progressives and the Moderates in the County Council bore fruit on Tuesday last in an agreement, in which both sides took part, that the Bills of the Water Companies in the ensuing session should be opposed. At the same time we find a token that the force of the Progressive policy is somewhat checked. The proposition to which we referred last week is adopted, by which the Bills are only to be opposed "so far" as, in the judgment of the County Council, they are "prejudicial to the interests of the ratepayers "and water consumers." In what degree the Bills are thus aggressive remains to be defined; and the point may prove to be a very small one, if indeed it exists at all. The opposition is founded on what has been called a "special regard to the policy of the "Council," which policy consists in seeking to get the water supply out of the hands of the Companies. Going a step farther back still, we find the Council, according to the phraseology of their own resolution, "divided in opinion as to what authority should be "entrusted with the administration of the water supply." Such, then, is the extent of the agreement between the two leading parties in the Council on the water question, and such is the shape of the resolution adopted last Tuesday. Sir John Lubbock understood it all to mean that the Bills should be allowed to pass their second reading, and should be "watched" when brought before a Select Committee, so as to see that the ratepayers shall not suffer. This reasonable form of opposition has not been that which the Council have hitherto cared to adopt. Neither is it very clear that they can be trusted to observe such moderation on the present occasion; for we find Sir John Lubbock, by a kind of after-thought, saying he "did "not wish to pledge himself to vote against these Bills "on the second reading." This precautionary announcement derives additional force from the circumstance that two other Metropolitan members—Mr. C. A. Whitmore and Mr. E. Bond—claimed the same liberty of action. Mr. Whitmore added to the difficulties of the situation by asserting that the apparent unanimity of parties on the water question was "only on the surface."

The resolution to which we have thus referred was the occasion of a speech by the Earl of Onslow, showing that the Moderates have cast in their lot with the Progressives to the extent of an agreement that the powers of the Water Companies should be transferred to a public authority. His Lordship stated that "all the members" of the Parliamentary Committee were now agreed upon this point. If so, Sir John Lubbock, who is a member of the Committee, must have given up his proposal that the Companies should be controlled and not superseded. Still unable to agree as to the authority which shall take the place of the Companies, the Council profess some kind of willingness that this part of the subject should be left to the decision of Parliament. But in the meantime the wants of London and its environs are pressing in respect to the actual water supply. So obvious is the necessity in this respect, that the Council evidently fear to block the way. The Welsh scheme is a far-off affair in more than one sense; and if it is to be carried out, time must be available. To quash the Company's schemes for an enlarged supply from present sources would be dangerous; and consequently the Council dare not kill the Bills which embody these schemes. It is impossible to wait until the long aqueduct connects London with Wales; and hence—if for no other reason, though others exist—some extension of the existing works must be allowed, though the Council will endeavour to place the Companies under the most onerous conditions that can be imposed. The Companies are to be exalted into the position of public benefactors without receiving any benefit themselves. Perhaps the Companies will consent, providing they can escape without positive damage. Concerning the famous Welsh scheme of the Council, the report in which the Water Committee recommended that a Bill should be introduced next year to carry out half of it, was withdrawn with singular alacrity last week, by the Chairman of the Water Committee, Mr. Idris, at the suggestion of Lord Onslow, who wished for a further report giving additional particulars. The records of the County Council thus abound in resolutions and reports on the question of the Metropolitan Water Supply; and a good many cheques have to be drawn as the process goes on, in order to defray legal, parliamentary, and professional expenses. If any useful purpose of a public character is ultimately secured, it certainly might have been accomplished at a much less expenditure of time and money. Negotiations with the Water Companies are now in hand for the second time; whereas terms of purchase might have been settled years ago, had the Council proposed a fair and equitable arrangement.

OBITUARY.

Mr. D. KINNEAR CLARK, M.Inst.C.E., who will be remembered by many of our readers for the elaborate series of experiments conducted by him on the domestic consumption of fuel at the time of the Smoke Abatement Exhibition in 1882, and for his subsequent valuable report upon the gas cooking and heating stoves, regulators, and governors shown at the International Electric and Gas Exhibition held at the Crystal Palace in 1882-3, died a few days ago in his 75th year. Mr. Kinnear Clark's work in connection with these undertakings was noticed in the "JOURNAL" at the time.

Mr. G. PARKER BIDDER, Q.C., the well-known Parliamentary Barrister, died last Saturday morning at Queen Anne's Mansions, Westminster, as the result, it is supposed, of an accident sustained a few weeks since in the streets of Manchester. The late Mr. Bidder was the eldest son of the celebrated engineer of the same name. He was born in August, 1836, and was educated at King's College School and at the Universities of Edinburgh and Cambridge, at the latter of which he graduated B.A. in 1858 as seventh wrangler. He was called to the Bar at Lincoln's Inn in 1860, became a Q.C. in 1874, and shortly afterwards a Bencher of his Inn. For several years he has been one of the leading Counsel at the Parliamentary Bar; and his name has been prominent in all the struggles between the Water Companies and the London County Council. Besides filling many public offices, he represented Mitcham (where he possessed a large estate) on the Surrey County Council. He was a Justice of the Peace for the same county; and he spent a great deal of time and money in protecting the rights of the inhabitants to Mitcham Common. He was Chairman of the Danish Gas Company, and of the Cannock Chase and Sydney Harbour Colliery Companies.

Received.—"Petroleum and its Products." By Boverton Redwood, F.R.S.E., F.I.C., Assoc.M.Inst.C.E., assisted by George T. Holloway, Assoc.R.Coll.Sc., F.I.C., and other contributors. In two volumes, with numerous maps, plates, and illustrations. (London: Charles Griffin and Co., Limited.)

Professor Boyd Dawkins on Our Coal Supply.—In the course of an interesting lecture given by Professor Boyd Dawkins in the Guild Hall, Preston, a few days ago, on the subject of the coal measures, he referred to the probable duration of the coal supply. He said it had been variously calculated at from 110 to 276 years; but he himself reckoned that the Durham and Northumberland field would continue to yield for 159 years.

The Effect of the Use of Gas-Stoves on the Coal-Carrying Trade.—Reference was again made by Lord Claud Hamilton, at the recent half-yearly meeting of the Great Eastern Railway Company, to the diminution in the quantity of coal conveyed by the Company in consequence of the extended use, in the whole of the suburban districts, of gas-stoves and stoves heated by enriched oil. It was estimated roughly, he said, that the railway had carried probably 100,000 tons less coal than it would have done if these stoves had not been in existence.

Acetylene as an Illuminating Agent.—M. Trouvé has devised a lamp, on the principle of the "Kipp" (commonly used in chemical laboratories), by which calcium carbide can be conveniently utilized for the production of acetylene for illuminating purposes; and an estimate of its working cost, as compared with gas as sold in Paris, is stated to be favourable to the new system. In London, however, supposing the carbide could be obtained at the same price as in Paris (4½d. per lb.), it is estimated that the cost would be double that of ordinary gas.

The Official Audit of the Metropolitan Gas Companies' Accounts.—In the notice of the life-work of the late Sir Henry Calcraft which appeared in the "JOURNAL" last week, it was mentioned that he was the Official Auditor under the Metropolis Gas Acts. It is interesting to record that his last duty in this connection was discharged literally upon his death-bed; for he signed the accounts of The Gaslight and Coke Company, which are given elsewhere, on the 21st ult.—the day before his decease. The accounts of the South Metropolitan Gas Company, also given in another part of the "JOURNAL," bear the signature of Mr. Spencer W. Gore. It will be seen, from the report of the Directors of the first-named Company, that owing to the death of Mr. Francis Farnan, one of the Auditors, a vacancy has been created in this department; and that Mr. Allen Stoneham is a candidate for the appointment. This matter is alluded to here because Mr. Stoneham was for a time the Official Auditor under the Board of Trade—taking up the work relinquished by the late Mr. Charles H. Parkes. Mr. Stoneham is at present the Official Auditor, under the Local Government Board, of the Metropolitan Water Companies' accounts.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 241.)

THE general course of things on the Stock Exchange was decidedly better than that ruling the previous week. There was a fair amount of business done in a quiet way, and especially was this the case among choice investment securities. The cause of these being the most active was perhaps the disposition to considerable caution, resulting from the apprehensive tendency which had marked the week before. The attention which the gilt-edged division thus came in for sent Consols up to 108⅛ (a record, we believe), and made its mark on the prices of Water Debentures in our special department. But, in addition to these, the general tendency was favourable in all the chief departments. Rails of all sorts rose; the Foreign Market was firm; and, even in more speculative quarters, there was some show of a revival of boldness and enterprise. The Money Market was quite unchanged; and the requirements of the settlement were very light. The condition of the Gas Market was much the same as the preceding week. Business was moderately active; and everywhere there were signs of great strength. A large number of issues made more or less considerable advances, and none receded. Among the Metropolitan Companies, Gaslight "A" was fairly active, and very firm at rising figures; stock on Tuesday changing hands at 305. The secured issues were rather brisk, and commanded good prices; but they did not advance their quotations. South Metropolitans were quiet and strong. Twice on Friday there were transactions in the "A" stock above the named figures; but the quotation was left unchanged. There was not much done in Commercials, but the new stock rose a couple of points. The Suburban and Provincial division were more than usually inactive; and the only move was a smart rise in Brentford debenture. The Continentals were good; and Imperial, Union, and European each scored an advance. Several of the minor undertakings in distant parts had a rise, as noted in the list. Business in the Water Companies' stocks was as slack as it well could be; but the tendency throughout was towards higher prices—the debenture stocks being especially buoyant.

The daily operations were: Gas opened moderately active on Monday, with a good strong tendency showing. Advances in quotation were scored by important issues. Gaslight "A" rose 1; Imperial Continental, 2; and Brentford debenture, 4½. Grand Junction Water improved 1. Business on Tuesday was rather quieter; but prices were excellent all round, although the only change in quotation was an advance of ¼ in Buenos Ayres. Gaslight "A" was done at 305. Wednesday's transactions showed little increase of activity; but all figures marked indicated strength in value. Commercial new improved 2. In Water, West Middlesex gained 2; and Grand Junction 1½. On Thursday, business fell away to about its lowest point in the week; but the advances in price were more numerous than on any other day. Imperial Continental and Belgrano debentures improved 2 each; and Bombay old, Buenos Ayres, and Oriental old, ½ each. Transactions in Gas revived somewhat on Friday; Gaslight "A" being especially active. Prices again moved up with an advance of 2 in Continental Union, and 1 in Imperial Continental. There was a pretty general advance in the value of Water debenture stocks. Grand Junction debenture rose 5; Chelsea ditto, and Lambeth ditto, 2 each; both East London ditto, 1; Southwark ditto, 1; and Southwark ordinary, 2. Business was moderate on Saturday; and the only advance in addition to those scored during the week was a rise of ½ in Cape Town.

ELECTRIC LIGHTING MEMORANDA.

An Electrician's Libel Case—The Lord Chief Justice on the Right of Public Criticism—The Difficulty of the Technical Reviewer—A Lesson for Reporters and their Critics.

IT is impossible for technical journalists to feel otherwise than sympathetic towards the defendants in the case of Hall *v.* Alabaster and others, determined last week in the Lord Chief Justice's Court in favour of the plaintiff, with £100 damages. This was a suit by an electrician who had made a professional report upon a storage battery, against the proprietors of the "Electrical Review," in which the report was adversely criticized. It appeared in evidence that the plaintiff was engaged to look into the merits of the appliance in question in the capacity of an electrical expert; and his report was intended to guide business men in regard to the practical or commercial value of the invention. His complaint was that the article in the "Electrical Review" represented this report as having been written by an incompetent person, in bad faith, and with the object of pushing an inferior invention. The defence was that the article was fair comment on a matter of public interest. It was also pleaded that the report was not intended for publication. What happened, however, was that the person who employed the plaintiff, having obtained from him a statement of the results of his testing of the battery, and his opinions thereon, circulated this statement among people who he thought might help to form a company; and one of these forwarded his copy to the journal in question. The editors send the report to a quarter whence they thought to get a reliable review, which they published in due course. It cannot be denied that the article was strongly worded. After raking over the statements of the report itself, the critic proceeded to animadvert upon it as an example of the "manner in which attempts are made by so-called expert reports to foist upon the public a certain manufacture;" and so forth.

The case occupied three days in the hearing; and according to "The Times" "there was the usual battle of experts" over the merits of storage batteries in general, and of this particular cell. Also as usual, when the Judge came to sum up, he remarked that "the amount of time occupied had been wholly disproportionate to the importance of the case," and proceeded to charge the jury with very small reference to the expert evidence. He observed that for a journal to criticise a report on a matter of legitimate public interest on its merits, or on the merits of the subject, is one thing; to make this criticism a peg whereon to hang aspersions on the reporter's motives, or on his competency, is another. His Lordship said that if the defendants had confined themselves to the technical objections to the report, it was doubtful whether a jury would have found this other than fair criticism. The article, however, went further than this, and talked at large about "so-called expert reports." The Judge acknowledged that the defendants had in Court disclaimed the intention of making any personal reflections on the plaintiff; but this was not enough. "The question was not what the defendants meant, but what the article meant;" and the jury responded by giving a verdict which was as good as a declaration that, while the article went beyond the limits of fair criticism, it was not written with animosity, and the plaintiff was consequently not entitled to recover more than his bare expenses in bringing an action to vindicate his professional position.

As already stated, we sympathize with the defendants, to a considerable extent; having painful experience of the perils that do environ journals whose editors possess a sense of their duty towards the public, which occasionally constrains them to publish thing that run counter to the interest of individuals. Technical periodicals are, of course, peculiarly liable to fall into such trouble as that from which our unfortunate electrical contemporary can only escape by paying. The public, for and by which such journals exist, look for explicit instruction in their pages respecting the very class of topics of the time which are the thorniest to handle. It might be argued that the law of libel needs re-examination, with the object of differentiating between the cases of ordinary newspaper reports and comments and those in which technical journals are concerned in regard to their speciality. As it is, a technical journalist who knows perfectly well what is the ulterior motive of the persons who invite him to a "press view" of some process, or put in circulation a report ascribing excellence to an invention, only ventures to disclose the facts as they appear to him at the risk of an action at law. The action may not be intended to be brought to an issue at all—often it is only meant to muzzle the journal for the period while the business to which it is known to be inimical is being "worked." This was not so in the case in point. Here the plaintiff undoubtedly had a *primâ facie* cause of complaint; and he has obtained his remedy, which we should be the last to begrude him or any professional man similarly situated. On the other hand, his critic had not the remotest desire to injure him personally, but only intended to denounce a general evil with reference to what he esteemed as a particular example.

The lesson will not be lost, either upon experts or their critics. An expert owes it to himself not to put his hand to any statement relating to his speciality, whether intended for general publication or not, which he is not prepared to defend in a professional manner, without having recourse to the terrors of the law. On the other side, public criticism must be strictly confined to the subject matter; and the temptation, which very easily besets a reviewer, to make the particular example a text for a homily on the delinquencies of a whole order, must be resisted and overcome. We are not of those who pretend that when a journal cannot truly prophesy smooth things of any person or object that may come up for notice in the ordinary way, it should keep silence, since to do this would be to deprive criticism of half its office and more than half its value. But there is, let us hope, a middle way; although, with the danger of being visited with legal proceedings on one side, and of sinking into inanity and uselessness on the other, this may not always be easy to find and to follow.

Centenary of the Completion of the Soho Foundry, Birmingham.—Last Thursday was the centenary of the completion of the Soho Foundry, Birmingham, with which William Murdoch was at one time closely associated. After passing through an eventful century of existence, the whole concern, it may be remembered, came to the hammer last year; and the plant was scattered far and wide. Fortunately, however, the historical records, extending over a period from 1765 to 1850, have been preserved; having passed into the hands of a member of the neighbouring firm of Tangyes Limited.

WATER BILLS FOR 1896.

THE following Bills promoted by local authorities, in addition to those noticed last week, refer to water supply.

The Darlington Extension and Improvement Bill contains a part relating to water. This comprises the usual powers as to supplying by measure premises partly used for trade purposes, supply of houses by one pipe, installation and maintenance of meters, and so forth. Private fire-plugs and hydrants are to be charged for at such rate as the Corporation may think fit; the amount to be recoverable in the same manner as charges for water supplied for other than domestic purposes. The consent of the Corporation is to be had for such attachments, subject to a penalty of 40s. for disregard of this provision, and of 20s. per day for failure to comply with a notice to remove same. [In a part of the Bill relating to gas supply, power is sought to purchase additional lands by agreement, for gas-works purposes; to confirm an expenditure of £4000 on gas-stoves; and to charge a differential rate of 6d. per 1000 cubic feet more for gas consumed outside the borough. Discounts of not exceeding 20 per cent. for prompt payment of gas accounts are to be sanctioned. For the extension of the gas-works, the sum of £50,000 is to be borrowed, and £10,000 for stoves and fittings.] The sum of £50,000 is to be borrowed for water-works purposes repayable in 60 years. Power is sought to create corporation stock. A novel clause in the Bill proposes that the Corporation may "reduce, remit, or give time for the payment of any rate made or assessed by them on account of the poverty or sickness of any person liable to the payment thereof."

The Edinburgh Extension Bill contains a part proposing to dissolve the Water Trust created and constituted by the Water Acts, as well as the Commission created and constituted by the Gas Acts, and constituting the Corporation, as extended to comprise the burghs of Leith and Portobello, the Authority or Commissioners for carrying the Acts into execution. The limits of compulsory supply of water are to be extended so as to include the whole of the enlarged city; and the Corporation seek power to redeem and pay off, by agreement, any or all of the existing water annuities. The amount necessary for this purpose is to be extinguished by paying into the loans fund an annual sum of one-sixtieth thereof. [The Portobello gas undertaking is to be acquired by agreement.] All the provisions of the Edinburgh Corporation Stock Act, 1894, are to apply to the borrowing powers transferred to the Corporation by the Act; and in estimating and fixing the contributions to be paid to the Loans Fund in respect of gas and water loans, the Corporation desire, if they shall think fit, to estimate and fix such contributions according to the interest and expenses payable on the securities existing at the commencement of the Act. Officers who may be compulsorily retired under the Act, are to be compensated according to the rules of the Civil Service. The sinking fund for repaying moneys levied under the Act is to be constituted by annual payments of one-thirtieth of the amount borrowed.

The Falkirk and District Water Bill is to provide an additional supply of water to the borough and district, by the construction of an enlargement of the existing reservoirs of the Trustees at Faughlin and Little Denny, subject to the liability to discharge into the Earls Burn an additional quantity of not less than 134,259 gallons of compensation water. For the purpose of repairing any works, water may be discharged into any available stream or watercourse. The limits of compulsory supply are to be extended, to comprise the enlarged borough of Falkirk. Water may be supplied in bulk to any public authority or person within the parishes of Bothkennan and Airth, in Stirlingshire, beyond the limits of the Act, subject to the consent of authorized water supply undertakers in these districts. It is proposed to make all rates and charges imposed under the Act preferable claims upon the estates of rated persons. A fifty-years' sinking fund is to be established. Certain sporting rights over one of the reservoirs conferred by the Act of 1888 are to be bought up by the Trustees. Water for other than domestic purposes is to be furnished upon such terms as may be fixed from time to time by the Trustees and appoved by the Sheriff, and published by being exhibited in the office of the Treasurer of the Trustees; the maximum charge so fixed to be 4½d. per 1000 gallons.

The Huddersfield Water-Works Bill is to authorize the construction by the Corporation of certain additional works for the extension of the supply to the township of Shepley, in the parish of Kirkburton, to be completed within ten years. The time allowed by the Act of 1871 for the completion of the Blakeley reservoir thereby authorized, which was extended by an Act of 1882 to July 13 next, is to be further extended to July 13, 1901. Additional lands and easements are to be acquired compulsorily, and others, for the purpose of protection only, by agreement. The consideration for any such acquisition may be either money or land, or a mixed consideration of money and land; and on any exchange, the Corporation may give or take any money for equality of exchange. The period allowed for payment of interest out of borrowed money is to be extended to July 25, 1905. The Corporation are to be empowered to supply water in bulk to local authorities, companies, or persons through whose district the new works are to be made; and for this purpose they seek to exercise the powers of the Water-Works Clauses Act, 1847, with respect to the breaking up of streets.

The Kirkcaldy and Dysart Water Bill is to authorize the Water-Works Commissioners of Kirkcaldy and Dysart to construct an additional reservoir in the parish of Leslie, upon the Lothrie Burn, and other works, including a dam on the Tongue Burn and another storage reservoir on the Arnot Burn. The waters of these streams are to be taken, subject to compensation. The sporting rights of the landowners are reserved. Land is to be compulsorily acquired within five years; and the works are to be constructed within ten years. The Commissioners are to give six days' notice of their intention to open roadways. Power is sought for the supply of water for hydraulic purposes. It is desired to borrow £100,000, to be repaid by the operation of a 1 per cent. sinking fund. In the clause defining the application of water-rents and charges, is inserted a provision to the effect that such portion of the cost of enlarging and increasing the plant and extending the works as the Commissioners may deem reasonable, is to be defrayed out of revenue.

The Lanarkshire (Middle Ward District) Water Bill provides for the abandonment, in consequence of engineering difficulties, of the construction of the reservoir No. 2 authorized by the Act of 1892, subject to the liability to compensate owners and occupiers of the land intended to be taken for the purpose. Another reservoir, to be situated on the Glengavel Water, is to be constructed, to entail a diversion of the Stratheven and Muirkirk highway; and an intake in the Patrick burn and several service reservoirs and pipe-lines are to be authorized. In addition to these works, reservoirs are to be constructed on the Lintmill and Logan Waters. Easements only are to be compulsorily acquired in certain instances. The water of twelve streams is to be impounded, subject, in the case of the Logan Water, to the discharge of compensation water at the rate of 800,000 gallons per day. The works are to be completed within seven years. It is provided that, until the District Committee are supplying water for domestic purposes from the works authorized by the Act of 1892, they shall from time to time pay all interest and instalments of principal, or set the amounts aside, and accumulate such payments with interest at the rate of 3 per cent., and charge the same against the rates leviable under the Act of 1892. And when and as soon as the domestic water-rate so authorized shall become leviable, the County Council are to be empowered to levy the same at such an increased annual amount as, when supplemented by the public water-rate, if any, shall suffice to repay the accumulated amount within any determined period not exceeding fifty years. The District Committee seek to be empowered to provide a public office for themselves and for the use of their officers and servants.

The Leamington Corporation Bill includes a part relating to water supply. The limits of supply are to be the borough. Additional lands to the extent of 20 acres are required, to be purchased by agreement. The supply is not at any time to be delivered at a pressure greater than is afforded by gravitation from the existing service reservoir. Domestic rates are set out at length, and are not to exceed 3 per cent. upon rateable values over £50, with extras. Water for other than domestic purposes is to be supplied by measure; and the amounts so due are to be recoverable in the same manner as water-rates. The sum of £10,000 is to be borrowed for water-works purposes.

The Manchester Corporation Bill contains a clause transferring the townships of Partington and Carrington in the parish of Bowdon from the district of the North Cheshire Water Company to that of the Corporation, and, with this object, amending section 5 of the North Cheshire Water Act, 1864. All powers possessed by the Corporation for the sale of surplus lands, are extended to ten years from the passing of the Act.

The North Wales Counties Lunatic Asylum (Water Supply) Bill is to authorize the Visiting Committee to construct water-works, comprising an embankment for impounding the lake known as Llyn Llymbran and the necessary subsidiary works, to be completed within five years. After supplying the Asylum, the surplus water may be sold to any person (but not for manufacturing or trade purposes) for the use of premises situated conveniently to the works, but not within the limits of supply of the Denbigh Water-Works Company.

The Padiham Urban District Council (Water) Bill is to extend the time limited by the Padiham Local Board Act, 1889, for the completion of a reservoir and other works by fifteen years. The powers for entering upon certain lands for the purpose of getting clay for the construction of their water-works, possessed by the Local Board under agreement with the owner, are also to be extended to the same period. The expenses of the Bill are to be paid within fifteen years.

The Sheffield Corporation Water Bill is to confer upon the Corporation power to impound the waters of the River Porter, or Little Don, and its tributaries. It is recited in the preamble that the Corporation at present take their supply from the lower portion of the watershed of the River Don, which is the natural source of supply for the populations of Sheffield, Doncaster, and Rotherham. The only available water from this source is that of the Little Don, which the Barnsley Corporation, by means of a pending Bill, are proposing to take, in opposition to the Corporations who claim to have a natural right to it. The Sheffield Corporation have agreed with the Corporations of Doncaster and Rotherham that, in the event of their obtaining

the powers sought by the Bill, they will afford to each of the Corporations a supply of water upon settled terms; and they are also willing, if the Barnsley Bill does not pass, to afford the Barnsley Corporation a supply of water upon terms to be hereafter determined. The Bill accordingly proposes to acquire lands within seven years, for the construction, within twelve years, of a reservoir, to be called the Langsett reservoir, to be formed by means of an embankment across the Little Don River; a second reservoir upon the Hagg Brook; and another reservoir, to be called the Midhope reservoir, upon the Little Don. The water of sixteen streams is to be taken, subject to the liability to compensate the Little Don millowners by discharging 4,712,631 gallons of water per day into this watercourse. The sum of £900,000 is to be raised for water-works purposes. The cost of all new meters provided by the Corporation after the passing of the Act is to be charged to capital account. Agreements between the Sheffield Corporation and the Corporations of Rotherham and Doncaster are scheduled. Water supplied under the provisions of these agreements is to be deemed part of the respective undertakings of the Corporations, who are to be authorized to borrow the money required to carry the agreements into effect. Upon March 25 last, the outstanding water loans of the Rotherham Corporation amounted to £85,303; and in view of the exceptionally heavy expenses incurred by this Corporation and their predecessors, by reason of the great difficulty of providing water for their district of supply, and having regard to the cost of the present scheme, it is proposed to reduce the payments for the redemption of this debt. A clause is inserted to bind the Corporation to supply Barnsley with such quantity of water, not exceeding 1,500,000 gallons per day, as may be required. Power is sought for the acquisition of the water undertaking belonging to the Stocksbridge Urban District Council.

Proposed International Exhibition in Brussels in 1897.—An international exhibition is to be held in Brussels next year. It will comprise fourteen sections, one of which will be devoted to heating and lighting.

The Zeitschrift fur Beleuchtungswesen, one of the latest of our German contemporaries, is now entering its second year; and it is announced that it will henceforth appear three times instead of twice a month.

The Provisional Order Applications for the Coming Session.—There have been in all 135 applications made to the various Government Departments concerned with the granting of Provisional Orders, in respect of Orders to be submitted for the approval of Parliament in the session which will open next Tuesday. Of these, twelve relate to the supply of gas, sixteen refer to water supply, and forty are in connection with electricity and electric lighting undertakings.

Institution of Mechanical Engineers.—The annual general meeting of this Institution was held last Thursday, in the theatre of the Institution of Civil Engineers. The President (Professor A. B. W. Kennedy) occupied the chair, and there was a large attendance. The annual report of the Council, which was adopted, stated that at the end of the past year the number of names in all classes on the roll of the Institution was 2270, as compared with 2222 at the end of the previous year. It was mentioned that the Council had bought a site at Storey's Gate, Westminster, with the view of providing a permanent home for the Institution. Among other technical matters dealt with by the Council during the year, was a memorial presented to the President of the Local Government Board for the repeal of existing statutes so far as they prevent mechanical locomotion on common roads, apart from traction engines. Professor Kennedy was thanked for his services as President; and the chair was taken by Mr. E. Windsor Richards, the President-Elect. The members then proceeded to the consideration of communications upon technical subjects; but they do not come within the scope of our columns.

Combustion of Coal and Gas in House Fires.—At a meeting of the Yorkshire Section of the Society of Chemical Industry yesterday week, a paper on "The Combustion of Coal and Gas in House Fires," was read by Dr. J. B. Cohen (of the Yorkshire College) and Mr. G. H. Russell. The first part of it gave an account of experiments to determine the quantity of soot given off by a coal fire burning house coal of different qualities. The amount was said to be, on the average, 6½ per cent. of the carbon in the coal. The question of the evolution of carbonic oxide from gas-fires was then discussed. From experiments, the authors concluded that there is practically no carbonic oxide given off from gas-fires with ordinary atmospheric burners. The paper also contained an account of tests as to the heating effect of different kinds of gas-fires compared with coal. The general conclusions were that the heating effect is largely influenced by the draught up the chimney; that where the chimney space behind a gas-fire is closed in, no ventilation of the room by way of the chimney occurs, and the heating is consequently enhanced; and that, on the other hand, where the fire-place is quite open, the draught in the case of the gas-fire is rather less than in the case of the coal fire, and the heating effect of the gas-fire is greater—that is to say, the rise of temperature is higher and quicker in the case of the gas-fire than in that of the coal fire.

NOTES.

Dr. Armstrong on the Luminosity of Flames.

In the course of an address by Dr. Armstrong, the President of the Chemical Society, which was devoted to the subject of the nature of chemical change and the conditions which determine it, mention was made of discussions that have taken place recently with respect to the causes of the luminosity of flames. Dr. Armstrong remarks that it has long been taught that the hydrogen is the more combustible element of hydrocarbons; and he admits that this doctrine has been too dogmatically and exclusively taught. He considers, however, that the more modern opposite view which is tending to become fashionable is probably based on an equally narrow interpretation of the phenomena, which, it can hardly be doubted, are of a very complex character, and likely to defy our powers of analysis for some time to come. Personally, Dr. Armstrong sees no absurdity in the idea that the hydrogen is first burnt and the carbon liberated, and the water subsequently unburnt by the carbon. But he prefers to represent such combustions as occurring within systems comprising at least oxygen, hydrocarbon, and water, and the products as being water, carbon monoxide, and hydrogen. In such a case, it would be incorrect to speak of either constituent as the more combustible; the nature of the change depending on that of the circuit within which it occurs, which may well vary with the conditions. Speaking of Dr. Frankland's theory of the luminosity of flames, put forward in a remarkable course of lectures delivered in 1867 at the Royal Institution (and reported in full in the "JOURNAL" exclusively), Dr. Armstrong declared that he had always felt attracted to these views, which he thinks have received far less attention than they deserve. Referring to recent observations of Professor Lewes, as calculated to revive interest in the subject, Dr. Armstrong accepted the acetylene hypothesis of Lewes as a partial explanation, while denying that it is necessary to suppose the production of solid carbon particles to be necessary to luminosity. The conversion of acetylene or other hydrocarbons at high temperatures into hydrogen and carbon, though a decomposition in the ordinary sense of the term, is doubtless, Dr. Armstrong thinks, a change involving the interaction of several molecules, and the consequent formation of carbon molecules of a high order of complexity, together with hydrogen molecules. This is exothermic, because the energy liberated in the combination of the carbon atoms among themselves, and also of the hydrogen molecules, is far in excess of that absorbed in the decomposition of the hydrocarbon molecules. "The initial luminance may, therefore, well be that of the molecules at the moment of formation prior to condensation, although the continued incandescence of the carbon molecules after their reduction to the solid state probably contributes largely to maintaining luminosity, giving to hydrocarbon flames their special value, perhaps." But this is to explain the phenomena in terms of Frankland's theory, as Dr. Armstrong understands it, and as appears to be necessary in order to account for the luminous appearance of a hydro-oxygen flame burning under pressure, and other cases in which the products of combustion are gaseous.

A Bisulphide of Carbon Motor.

Another attempt to utilize bisulphide of carbon in the production of motive power has been made; the sanguine inventor this time being Mr. J. R. Bennett, of Philadelphia. As described in the "Electrical Engineer," the Bennett arrangement consists in mounting a reservoir of bisulphide of carbon on the top of a steam-boiler, from which the heat is taken for its vaporization. The connections are so arranged that, at any time after steam has been got up, it can be used to vaporize the bisulphide, which takes its place in driving the motor. It is claimed that in this system the pressure of the bisulphide vapour is maintained with perfect constancy at 125 lbs., and that the vapour does not exert any deleterious action upon the metal of the engine. A special lubricating agent is, however, required for the cylinder. But no information of the smallest technical value is forthcoming as to the performance of the Bennett combination of steam and bisulphide of carbon; so that the advantages of the arrangement are left problematical. It appears to be claimed, however, that the substitution of bisulphide of carbon vapour for steam in a particular engine will enable the same motor to do about six times the amount of work for the same fuel consumption.

The Metric System and Screw-Threads.

In an article on the subject of the metric system of weights and measures, with regard to the possibility of its adoption in the United Kingdom, "Engineering" discusses generally various engineering aspects of the question, with particular reference to the detail of standard screw-threads. It is acknowledged that there are certain features in engineering practice in which the metric system has not brought uniformity, even in France; and the most important of these is screw-threads. The amount of confusion existing in regard to screw-thread practice is made apparent by the recital of the facts. In England, the Whitworth gauge is universally employed for bolts; but not for pipes, which are screwed to the "gas thread." Germany also employs the Whitworth thread largely, but not universally. This means a

combination of screw-threads measured by the inch, with bolt-heads and shanks measured in millimetres. In France, many of the principal engineering shops and the railway companies have their own screw-gauges; while in the United States the Sellers gauge is in general use. The general conclusion is that an altogether new gauge will have to be devised; and contributions to a settlement of the difficulty are invited. It is admitted that the case of the gas and steam pipe trades is full of difficulty. But it is idle to talk of accepting the metric system of measures in engineering practice until this initial obstacle of its application to screw-threads is cleared away.

The Reproduction of Tracings by Photography.

Mr. G. E. Brown, F.C.S., recently brought under the notice of the New Swindon Junior Engineering Society the subject of "Processes for the Reproduction of Tracings by Photography." He began by setting forth very clearly the principles of the various processes of sun-printing, or heliography, and explaining the chemical nature and constitution of the compounds employed. As is pretty generally known, the ferric and ferrous oxides form the basis of these compounds; but a most essential condition is that the ferric salt shall be associated with some form of organic matter which is of an oxidizable nature. The action of light on the iron compounds next received Mr. Brown's attention. After he had demonstrated this phase of his subject, he proceeded to give particulars of the appliances required, and of the processes of heliography in common use. These may be said to be the ferro-prussiate, or white line; the cyanotype, or blue line; the ferro-gallic, or black line; and the platinotype and zincographic. In the description of these processes, several features are noticeable. In the white-line process, the purity of the iron compound should be assured. The insolubility of the gum employed in the blue-line process, when exposed to light with a ferric salt, has an important bearing, as it is an efficient preventive of the penetrating effect of the reactionary solution. The ferro-gallic process has the recommendation of simplicity of treatment; while the platinotype process, although expensive, serves well to reproduce small-scale drawings. The zincographic process is applicable when a very large number of copies is required. Mr. Brown concluded with a comparison of the processes described; and specimens were exhibited to illustrate the subject. A discussion took place, which was chiefly devoted to the consideration of the practical usefulness of the various reproductions in drawing-office and workshop practice.

The Electrolysis of Gas-Mains.

In an article on the electrolytic action of the return currents of electric tramways published in the "Electrical Review," Mr. John Gray, B.Sc., remarks that the discovery that the earth cannot be safely used for the transmission of large return currents has been one of the unexpected outcomes of the extension of electric tramways in towns. The gas and water mains and armoured cables in every large town form a network of uninsulated conductors everywhere in contact with the earth, and any current flowing between two points on the earth's surface will be partly carried by these underground conductors. At the surface of contact between the pipe and the earth where the current enters the pipe, no harm is done; in fact, one would expect that the natural process of corrosion would be arrested or reversed, and the pipe surfaces brightened. At the surface where the current leaves the pipe, however, corrosion will be accelerated by an amount proportional to the magnitude of the current leaving the pipes. The activity of this corrosion will depend to a certain extent on the moisture and salts in the soil; but in no instance is it likely to be absent. It has been found in the case of San Francisco, where the subject was investigated by Mr. Stuart Smith, that the resistance of gas and water pipes is due almost entirely to their joints; the section of metal in the pipes having very little influence. This fact explains the unexpected observation that the resistance of gas-pipes was rather less than that of water-pipes; the joints of the former having usually less resistance then those of the latter. Mr. Wilkinson, another inquirer into the same subject, has stated that the separate feeder system would get rid of the trouble; but this idea is now regarded as erroneous. Mr. Harold P. Brown has proposed a plan which is considered by Mr. Edison as the only satisfactory method of preventing electrolytic action in connection with electric tramways. This plan consists in keeping all parts of the underground pipes at least a few volts below the rails and the surrounding earth. The object is attained by connecting the pipe systems near the power-house by an insulated feeder to one of the dynamos with a voltage 12 volts in excess of the normal voltage of the other dynamos which have negative terminals connected to the nearest point of the rails. This system is described as cheap, and likely to considerably reduce corrosion. But it causes a current in the pipes which, in view of Mr. Stuart Smith's observations, must in course of time produce corrosion at the pipe-joints. By one or the other, or both, of these systems it is considered that the electrolytic corrosion of pipes, if not entirely prevented, can be greatly reduced. Whether the steady action of the strong currents that would still remain will increase the natural rate of main corrosion to the extent of giving the proprietors a right to compensation, is a question left unanswered by Mr. Gray. Up to the present time, there is not sufficient evidence upon this head.

TECHNICAL RECORD.

THE STANDARD OF LIGHT.

At the Meeting of the Society of Arts last Wednesday—Captain W. de W. Abney, C.B., F.R.S., in the chair—Mr. W. J. DIBDIN, F.I.C., F.C.S., the Chemist and Superintending Gas Examiner of the London County Council, read the following paper dealing with the above-named subject.

On the 21st of December, 1888, I had the honour of reading before the Society of Arts a paper on the subject of the standard of light.* In that paper I discussed the position of the question as it then stood; summing up briefly the results of the various inquiries conducted from time to time by authorities in this country and on the Continent. The position in which the question had then arrived may be shortly put thus: The authorities of the Board of Trade—the controlling authority for gas-testing purposes in London—the gas interest generally, as represented by The Gas Institute, and the British Association, had all joined in one condemnation of the existing candle, and in demanding an alteration, and, with one exception, that such alteration should consist in the adoption of Mr. Harcourt's pentane air-gas flame.

After careful consideration of these facts, an impartial observer would probably have drawn the conclusion that the time was then ripe for a change, and that legislation would follow without delay. Unfortunately, other counsels prevailed; and we have now arrived at a period seven years later, without the attainment of the alteration so earnestly desired and looked forward to by all those interested in the subject, who have made it one of special study, and who daily experience the discomfort of having their best endeavours marred by the imperfect nature of the standard employed, as by Act of Parliament they are compelled to use the long since discredited candle instead of one of more reliable substitutes.

In view of the uncertainty prevailing in the minds of the parliamentary experts of the Board of Trade, rather than in that of their scientific advisers, a further series of inquiries was instituted by a Committee appointed by the Board on Dec. 23, 1891. The Committee was composed of representatives of the two controlling authorities for gas testing in London—viz., the City and the London County Council; the three large Gas Companies (The Gaslight and Coke, the South Metropolitan, and the Commercial); the Gas Referees; and two independent representatives of the Board of Trade. In connection with the appointment of this Committee, it is to be noted that it was not until the South Metropolitan Gas Company came forward with an offer to meet the expenses that it was constituted, as neither the Board of Trade nor the controlling authorities had funds at their disposal for the purpose. Probably this action on the part of a commercial Company forms the strongest argument in favour of the long-desired alteration that can be put into words.

After three years of most patient work, during which all the points were carefully and exhaustively reviewed, the Committee issued their report; and the question has consequently taken one more step forward, though, as a matter of fact, the scientific result is, to all intents and purposes, in much the same position—viz., the candles are (if possible) still more hopelessly condemned, and one of the proposed more reliable substitutes is recommended for adoption in their place. Mr. Harcourt's pentane standard has again been vindicated as a reliable and exact standard; and, for practical use in gas testing, the pentane argand, proposed by myself in 1886, has been chosen as a suitable substitute for candles in daily work. It is to be hoped that the unanimous report of a Committee, expressly selected so as to include representatives of all the various interests concerned, will result in speedy legislation, and thus at last put an end to a controversy which has been one of the vexed questions of the day for more than twenty years.

In the meantime, it will be desirable that the essential features of this last official report should be fully discussed; and, with that view, I venture to submit the following summarized account of the work of the Committee, as given in the report. The various points may be considered in the following order:—

1.—Unsatisfactory standard furnished by the flame of a sperm candle, by reason of the amount of light which it affords varying over a wide range, under conditions as to the manufacture of the candle, as to its mode of use, and as to the adventitious circumstances attending its employment, which, as a whole, it is not possible to regulate and define.

2.—The advisability of continuing to express, as heretofore, in official documents and reports, the quantity of light yielded by coal gas burned under specified conditions, in terms of candle light; the actual comparison, however, being made between the gaslight and some well-defined and constant light ascertained to be equal in quantity to, or a definite multiple of, the average light given by the standard sperm candle.

3.—The conclusion that, in the present state of experience and knowledge, the source of light to be used as a standard by gas testers generally must be produced by the process of combustion, and be in the nature of a flame.

* See "JOURNAL," Vol. LII., p. 1108.

4.—That the one-candle light flame proposed by Mr. A. Vernon Harcourt does constitute a very exact standard, capable of being reproduced at any time without variation of illuminative value; and that this flame is a true representative of the average light furnished by the sperm candle flame constituting the present standard.

5.—Inasmuch, however, as there is a practical advantage in comparing directly the light of such a coal-gas flame as is usually tested (being, that is, of about 16-candle light value), with a light approximating somewhat in value thereto, the Committee submitted to careful examination the flame of the ten-candle light pentane argand proposed by the author as a standard in 1886. This flame is produced by burning a mixture of air and pentane vapour from a suitable argand burner, provided with an opaque screen, by which the light from the upper portion of the flame is cut off. The screen being set at a definite height, the luminosity of this portion of the flame remains constant, even under considerable variations, owing to a compensating action affecting the lower or exposed portion of the flame.

6.—The amount of light emitted by the lower portion of the flame is substantially equal to ten times the average light of a standard sperm candle flame, or to ten times the light of Mr. Harcourt's one-candle pentane air-gas flame.

7.—That any number of the Dibdin argand burners may be produced, and may be depended upon to furnish a flame giving, when duly screened at the top, ten times the average amount of light given by a sperm candle.

8.—Then follows the recommendation that the pentane-air flame furnished by this pentane argand burner be accepted as giving the light of ten standard candles, and that it be authorized and prescribed for official use in testing the illuminating power of the gas supplied by the London Gas Companies.

9.—With a view to making some provision for future possible improvements and requirements, the Committee further recommend that the Gas Referees be authorized, should they at any time see fit, to approve and certify for gas testing any other flame based upon the ten-candle standard defined above, which they may consider suitable for the purpose, whether produced in a like or unlike way, and having the same or a different multiple value; such other flame, however, not to be used for gas testing unless approved by the Board of Trade, and unless the Gas Companies give their consent to its adoption as a standard.

10.—The Committee then proceeded to recommend that the illuminating power of coal gas shall continue to be recorded as heretofore, in terms of the light given by a specified number of cubic feet (to wit, 5) burnt per hour from the standard "London" argand burner, but that the requirement that the gas shall actually be consumed at that rate be rescinded, so as to allow the Gas Referees to sanction a mode of testing in which the gas shall be burned at whatever rate is found requisite in order that it may give a light equal to that of the prescribed number of candles, and in which the illuminative value of the gas shall be calculated as being inversely as the rate at which such gas had been burned during the testing so as to give this amount of light.

The chief error in the amount of light emitted by a candle is due to variations in the character of the wick employed. Exhaustive experiments have shown that the number and size of the threads in the wick, the closeness of the plaiting of the strands, the pull on each strand during plaiting, the previous cleaning of the cotton used, the treatment of the wick by the manufacturer, and the extent to which the wick is stretched when set in the candle-mould by the workman, are all factors of considerable importance affecting the light which a candle gives. Various other conditions also influence the result, such as the length of time it has been burning, whether the "cup" of the candle is dry or contains melted sperm, the roughness or smoothness of the wick, the curvature of the wick, &c. Added to these difficulties we have the impossibility of making candles which will burn 120 grains an hour. The Gas Referees' Instructions allow the use of a candle burning within 5 per cent. of the prescribed amount; but even this does not overcome the trouble, as candles very frequently burn outside these limits—departures of even 10 to 20 per cent. being by no means unknown.

In Germany, sperm candles have been abandoned for paraffin candles, made under the supervision of the authorities, and specially marked. But the same troubles are experienced as with the sperm candles. The Committee, therefore, unhesitatingly recommended the abolition of the candle as a standard of light, and the introduction of some more reliable unit.

The decision of the Committee respecting the continuation of the practice of stating the quantity of light in terms of the candle will doubtless recommend itself to all persons interested in the question. The unit thus expressed is one which is well understood generally; and, while being in itself convenient, it represents a quantity of light which is practically the smallest used in daily life. It is only exceptional radiants, such as the arc light, concentrated by a lens, that emit larger multiples of this unit than a few hundred times its value, and no inconvenience can be experienced in such cases; while the introduction of a new term, such as "Carcel," would lead to unnecessary confusion.

The expression of opinion that the source of light to be used as a standard must be produced by the process of combustion, and be in the nature of a flame, is well advised in view of the experience of the past. As I pointed out in my previous paper in 1888, numerous investigations had been made as to the possibility of producing a constant light by a process of incandescence of solid bodies, notably platinum. But the unreliability of such methods was well illustrated by the researches of the British Association Committee, aided by the work of this Society, through its Secretary; and since that time no progress seems to have been made in this direction. The suggestion to obtain a constant light by means of the incandescent electric lamp has completely broken down, in consequence of the more or less rapid depreciation of the initial intensity, owing to the gradual discoloration of the interior surface of the glass globe.

The following series of special experiments on this point will serve to show the difficulty with which such a standard would have to contend. The tests were made when the current was practically constant:—

Number of Hours the Lamp had been Alight.	Illuminating Power.	Number of Hours the Lamp had been Alight.	Illuminating Power.
0	14·8	453	10·8
96	14·0	520	11·5
168	13·0	612	10·5
307	11·5	709	10·5
357	11·8	761	10·5

The loss of 5·4 per cent. in the first 100 hours might not be considered an insuperable difficulty, as a lamp could be renewed at more frequent intervals. Another practical difficulty, however, is the variation in voltage of the current; a loss of only 3 per cent. having been found to affect the quantity of light by as much as 27 per cent. From these facts, it will be seen that the Committee had good reasons for their decision.

The conclusion that Mr. Harcourt's pentane air-gas flame constitutes a very exact standard, is only one more piece of evidence in favour of the admirable work of that gentleman. Though the particular form in which the pentane and air are to be employed, if the decision of the Committee takes legal effect, has been varied by the introduction of the pentane argand burner, the thanks of the community are due to Mr. Harcourt for first calling attention to the standard combustible material thus adopted. Without his preliminary investigations in this direction, it is probable that the question would have still been farther from solution than it is at present. It is, indeed, only due to that gentleman to place on record once more the altogether admirable work with which his name is associated.

It is to be noted that the work of the Committee resulted in the discovery of a point in connection with the one-candle pentane air-gas flame which had been overlooked in certain previous investigations. This was that, when the flame was set by an observer who viewed the whole of the luminous portion, the tip of the flame was put too high as compared with the settings made when the body of the flame was obscured by a screen. A number of experiments made to determine the error thus introduced, gave a mean difference of 2·59 per cent. On applying this correction to those average results obtained by means of the pentane flame, when set without the use of a screen, the Committee found the following values of the pentane air-gas flame, as obtained at various periods by different observers, who had compared this proposed standard with candles:—

Observer.	Value in Standard Candles.	Date.
Mr. Vernon Harcourt	0·994	1879
Messrs. F. Livesey and W. Brown	0·990	1879
Mr. Harold B. Dixon	0·998	1881
Mr. Dibdin	0 998	1887
Do., including all experiments	1·016	1887
British Association Committee	1·006	1888
Mr. Greville Williams (*a*)	1·008	1891
Mr. Greville Williams (*b*)	1·050	1891
Professor Harold B. Dixon	0·998	1891–2

The mean value of all experiments made between 1878 and 1892 with the pentane unit against standard candles when thus corrected, ascribes a value of 1·007 to the pentane flame. If one abnormally high result be omitted, the value becomes 1·001.

Satisfactory as this result was, it was nevertheless felt that, in order to reduce as far as possible any errors which atmospheric influences might introduce, it would be best to adopt for the daily testing of gas a standard burner giving a light more nearly approaching that of the flame to be tested, which can be easily worked, and in which slight errors in manipulation shall not give rise to serious errors in the results. The ten-candle pentane argand seemed to satisfy these conditions; and the Committee undertook the requisite experiments to determine the point. The burner used was supplied by Messrs. Sugg and Co.; and on standardizing it under the prescribed conditions by the one-candle pentane air-gas unit, it was found to give a value of 10·004 candles. The preliminary experiments to ascertain if very extreme variations in the height of the flame affected the amount of light given out, showed that with the extreme limits possible, which could never be approached with the most careless manipulation, the deviation from the normal value would only raise the standard by 10 per cent., or decrease it by 6·2 per cent.; this latter result being obtained when the flame was tailing above the top of the chimney!

An extended series of observations was made to ascertain within what limits of height of flame the light passing under the

screen of the standard burner remained constant. At the same time, the effect of replacing the air with coal gas was tried to see whether any, and, if so, what difference would be caused thereby. The result showed that both with air and with coal gas the ten-candle pentane argand gave practically uniform results with a flame burning between the limits of 2½ inches and 4½ inches in height; while if by any mischance these very wide extremes should be exceeded, the results obtained are slightly in favour of the gas being tested. In like manner, experiments made to ascertain whether the depth of pentane in the carburettor influenced the light, by altering the amount of air space over the surface of the pentane, resulted in showing that, as long as there is sufficient pentane to cover properly the bottom of the carburettor, the results obtained will not vary, while they again established the fact that atmospheric air may be used instead of coal gas as the carrying medium. Another most important point is that the temperature of the carburettor may vary about 40° Fahr.—viz., from 40° to 80° Fahr., without influencing the value of the standard. The only alteration found was in one case, when the level of the pentane was too low; but when the carburettor was kept about half full of pentane, the results were constant.

Testings were further made to ascertain what change, if any, the ten-candle pentane argand might undergo as the atmospheric pressure varies; and from these the conclusion was drawn that the value of the standard is not materially affected by such variations of atmospheric pressure as commonly occur.

The important point of uniformity was then tested. For this purpose, Mr. Sugg was requested to make two dozen of the burners, which were distributed among members of the Committee, who found that they all gave results practically identical.

In order to ascertain whether the burner first submitted was capable of modification so as to simplify its construction, without affecting the constancy of the light emitted by the flame when at various heights, a number of experiments were made, with the result that the Committee arrived at the conclusion that the ten-candle pentane argand would, with a slight modification, be in every respect a trustworthy standard when supplied with atmospheric air carrying the vapour of pentane supplied by the carburettor provided. The modification alluded to consisted in the substitution of a rectilinear for a curvilinear solid cone, for greater convenience and certainty in measurement, and defining the distance at which it is to be fixed below the centre opening of the burner.

[The author then reproduced the description of his ten-candle pentane air-gas standard as contained in Section IX. of the appendix to the report of the Standards of Light Committee, and given in the "JOURNAL" for May 14 last, p. 1021.]

The pentane employed to produce the air gas used in Mr. Harcourt's one-candle standard, and in the carburettor of the ten-candle pentane argand, was obtained by purifying light petroleum by the successive action of sulphuric acid and soda solution, and then distilling at 60° C., at 55° C., and twice at 50° C. It was, however, considered important to obtain samples of pure isopentane from other sources, in order to ascertain if the air gas prepared from them would give the same amount of illumination as with the normal pentane. For this purpose, a sample of so-called pure isopentane was obtained from Berlin; but, on examination, it proved to be unsatisfactory. Accordingly Professor T. E. Thorpe was requested to have a sample of pure isopentane prepared. This task he kindly undertook; and with the assistance of Mr. A. Greeves, three specimens were made and submitted to the Committee. The method used was, shortly, as follows: The mixture of active and inactive amyl alcohols, obtained by the purification of fusel oil boiling from 120° to 130° C. under a pressure of 760 mm., was converted into a mixture of iodides, which was then reduced to isopentane by means of the zinc copper couple. Three samples were thus prepared from German, Scotch, and Irish fusel oils; all the conditions being strictly comparable. These were handed to the Committee and experimented upon both with the one-candle pentane flame and the ten-candle pentane argand. In the case of the former, it was found that rather more light was yielded by the isopentane than by the normal pentane obtained from petroleum. In the case of the ten-candle pentane argand, however, identical results were obtained with either sample; this doubtless being due to the remarkable compensating action of the flame yielded by that burner, in a manner similar to the compensating action which takes place when air is replaced with coal gas as the medium for driving forward the vapour of the liquid pentane in the carburettor. This result points to the conclusion that the pentane argand enables either of these combustible materials to be employed without any practical difference in the amount of light passing under the screen, and employed as a standard. Hence, should there be at any future time a suspicion that commercial pentane has altered in respect of its illuminating value, it can always be standardized by an appeal to the light of the pentane argand burner fed with air carburetted with pure isopentane.

An important question having been raised by Mr. J. Methven as to the effect of the humidity of the atmosphere upon the amount of light emitted by a luminous flame, the Committee gave the matter very careful consideration; and a prolonged series of experiments was undertaken by the Secretary, Professor Vivian B. Lewes, F.I.C., to elucidate the matter. Mr. Methven had found that, when the temperature was practically constant, candles gave, per 120 grains of sperm consumed, a light equal to 1·104 as compared with a constant source of light (Methven screen), and that this was increased to 1·196 when the air in which the candles were burning was dried. This difference in the light-value he considered to be due entirely to the removal of the moisture, as the temperature remained the same. He also found that, when air saturated with moisture at increasing temperatures is supplied to a flame, the light-value rapidly diminishes; so that between the temperatures of 50° and 75° Fahr. a diminution of 10 per cent. takes place in the light emitted by an argand flame burning 5 cubic feet of gas per hour, while with a flat flame there is a reduction of 12·2 per cent., and with a gas-flame from a two-candle burner a loss of 13 per cent. is found within the same range of temperature.

Mr. Methven ascribed these differences to the different power of the flames to battle with the aqueous vapour. The result of the Committee's experiments was that, though by abnormally saturating or drying the air supplied to a flame, variations as great as those obtained by Mr. Methven undoubtedly do occur, yet that, in a well-ventilated testing-room, with the temperature kept within a narrow range, no such great differences are to be found. These conclusions were also supported by the experience of Mr. Vernon Harcourt, Mr. Greville Williams, and Mr. W. C. Young. It did not, therefore, appear to be necessary to take this otherwise important point into consideration in connection with the inquiry, especially as the value of the standard recommended was so close to that of the light to be tested; and thus any variation in the one would be balanced by that in the other.

In view of the definite results obtained, the recommendation of the Committee to the effect that the Gas Referees should be authorized, should they at any time see fit, to approve and certify for gas testing any other flame based upon the ten-candle pentane argand would appear to be unnecessary, as opening the door to alterations from time to time, and thus again reopening the question which all desire so earnestly to see settled. The provision, however, that no alteration should be so made without the sanction of the Board of Trade and the Gas Companies would provide a safeguard against any interference with the standard on trivial grounds, and is well advised. But undoubtedly the other parties to the contract—viz., the controlling authorities, as representatives of the public—should be equally represented with the Gas Companies; and doubtless this will be provided for in any Act legalizing the present proposed alteration. In that case, no objection can be raised to the clause; and the advantage gained would be that, in case the advance of knowledge should place in the hands of the operator a still more convenient and reliable process, it would not be necessary to incur the delay and expense of another Act of Parliament—the needful authority for a change being merely a notification of the Gas Referees to that effect.

To many it may seem to be a matter of regret that the question of the method of burning the gas to be tested should have been imported into the inquiry, as tending to complicate the simple matter of the standard of light, especially as it is a question of how far any benefit would arise to the public generally by such a change; the possibility, indeed, being that it would tend solely in favour of the sellers rather than the users of gas. As, however, the gas companies were urgent in representing the desirability of this point, as appears from the notes of the interview which the Committee had with the representatives of the Incorporated Institution of Gas Engineers and the Incorporated Gas Institute, such an alteration as proposed—viz., "that the requirement that the gas shall actually be consumed at the rate of 5 cubic feet be rescinded, so as to allow the Gas Referees to sanction a mode of testing in which the gas shall be burned at whatever rate is found requisite, in order that it may give a light equal to that of the prescribed number of candles;" or, in the words of the gas representatives, "that the rate of the consumption of gas to be tested be adjusted as nearly as practicable to the maximum efficiency of the various standard burners"—does, in effect, upset the existing bargain between the gas companies and the public, as repeatedly sanctioned by Parliament. The simple substitution of a reliable for an unreliable standard is a question which does not affect the existing contract; whereas the Committee afford no evidence of an experimental character to warrant the further change thus proposed.

Having thus fully considered the most recent work in this connection in England, it will not be without interest to discuss the most modern work on the Continent on the subject. This is contained in the report of the Dutch Gas Association on Photometry, which was issued in 1894.* The report is an able and exhaustive account of a special inquiry upon the whole question of photometry as applied to the estimation of the illuminating power of coal gas, and especially so with regard to the standard of light. After a careful *résumé* of the work hitherto accomplished in this direction, the Committee of the Association arrived at the conclusion that none of the existing proposals met all the requirements of an ideal standard; and consequently they proceeded to devise a method which they

* An abstract of this report was given in the "JOURNAL," Vol. LXIV., pp. 1161, 1209.

considered fully answered all purposes. It is to be noted that their report contains no reference to the pentane argand, which does not appear to have attracted their attention, although it has now been before the public for nearly ten years, but in a less prominent form than it has now assumed in consequence of the work of the Board of Trade Committee.

The lamp designed by the Dutch Association is based upon the one-candle pentane lamp (known as the "P2" lamp) of Mr. Vernon Harcourt, in which that gentleman employed the device, first introduced by myself, of cutting off the top portion of the flame, by means of a screen, in a manner similar to that employed in the pentane argand. Instead of using pentane for the fuel, a mixture of 9 parts of benzol to 100 parts of sulphuric ether is preferred. Experiments showed that between 7·7 and 11·2 parts of benzol, the effective variation of the light is only 1 per cent.; while between 8·5 and 10·2 parts, it is only 0·1 per cent.; and the light is therefore practically constant when the benzol varies between 8·5 and 10·2 parts to 100 parts of ether. This mixture, made up with ether of ·7215 sp. gr. and benzol of ·886 sp. gr., had a specific gravity of ·7335, all at 15° C. But it was found that, after 33 per cent. of the contents of the reservoir had been burned away, the residue retained exactly the original specific gravity of ·7335. The mixture had, therefore, evaporated, as a whole, and could thus be used as a standard fuel for the lamp. Various experiments with pure and impure ether showed that no difficulty could be experienced in daily work from casual impurities, although pure ether is recommended for use in standard instruments.

Using this arrangement as a standard, the Dutch Committee found that the amyl-acetate lamp = 0·9213 candle, = 0·8333 German candle; the English candle = 1·0854 amyl-acetate lamp, = 0·9045 German candle; the German candle = 1·2 amyl-acetate lamp, = 1·1053 English candles. Three specimens of the carcel lamp were tested, with the average result that the carcel is equal to 9·631 English candles. This agrees with Messrs. Kirkham and Sugg's experiments in 1869. They found the carcel to equal 9·6 candles; and the tests made by myself in 1885, when comparing it with the Keates lamp, gave as the result 9·61. A series of tests against the one-candle pentane air-gas flame made at the same time as those with Keates's lamp gave a mean result of 9·35 candles, which, however, corrected for the method of setting the pentane then employed, as above described, by the factor 2·59 per cent.—a correction only discovered seven years later—gives a result equal to 9·63 candles. These remarkable coincidences of the results of different observers at widely different periods, and by equally widely different methods, are not a little satisfactory in many respects; and they serve to show the nature of the work which can be accomplished when a sufficiently large number of experiments are made to eliminate accidental errors due to isolated tests.

From the foregoing *résumé* of the position of the question of providing a substitute, acceptable to all parties, for the present legal candle, it will be seen that all that remains to be done is for Parliament to sanction the proposed change, and, by thus legalizing the pentane argand, bring to a conclusion a question which has gradually ripened until it would seem as if the last word had been said; and there is nothing to delay the closing scene by parliamentary action. Sufficient time has elapsed since the publication of the report of the Committee for a thorough trial of the new standard; and there should be now no question as to the result. It is to be hoped that the discussion of the facts which I have ventured to place before the Society will be such as to strengthen the hands of the Board of Trade when dealing with the matter during the ensuing session of Parliament.

Discussion.

The CHAIRMAN called upon Mr. Vernon Harcourt to open the discussion.

Mr. HARCOURT said he rose at the bidding of the Chairman; but he could add but very little to what Mr. Dibdin had said. Indeed, if he had been asked to give a paper on the subject before them, having in his recollection the work of the Committee on which both Mr. Dibdin and himself had been engaged for two years, it would have borne a great likeness to the one they had heard; and there were only one or two points to which he should wish to make any addition. Perhaps it would have been wiser if the Committee had limited themselves to the matters referred to them, and only made a recommendation as to the standard of light. But they did make one on a subject nearly related to it, because it affected the actual use of the standard in testing the illuminating power of gas. It was to the effect that, instead of the gas being tested at the uniform rate of 5 cubic feet per hour at the standard burner which had been authorized for testing purposes, it should be burned at such a rate as would give from that burner a uniform light of 16 candles. Working in that way, the light might still be stated as giving the illuminating power of the gas by taking it that the quantity of gas required to give a certain amount of light varied inversely with the quality of the gas. That was substantially true. If the recommendation were adopted, there would be the advantage that the quality of the gas would be judged precisely from the consumers' point of view; for that which mattered to the consumers was the quantity of gas which would be burned to produce the desired light. It was very important that the knowledge should be as widely spread as possible that the eye was a very bad photometer, and that one could not tell, by looking at the light of a burner, what was the quality of the gas. Complaints of bad gas arose nearly always in consequence of the gas reaching the burner at insufficient pressure. The effect was therefore small, and the consumer complained that the gas was bad. Actually it was not possible, over a very wide range of quality, to judge, by looking at the flame, as to the quality of the gas being burned. The actual difference was in the quantity; and this eluded attention. There were so many other circumstances which might affect the quantity that passed through the meter—the number of lights, the time during which they were burning, other burners being introduced, the use of gas for cooking and heating—which sufficiently accounted for the variation in the meter record, which sometimes caused grumbling. But among the various causes that might increase the consumption was one which could not be so easily noted, and it was that due to the variation in quality. It was for this reason that the Committee, though perhaps going a little out of their way, recommended that the measure should be of the quantity of gas required to be burned in order to give a particular light. Such a mode of testing would go more nearly than the present with the effect on the consumer of a variation in the quality; and it would do more justice to those who supplied it. With the particular gas tested, a really small variation in the quality was recorded by the present method as greater than it really was. If the quality of the gas were rather less good than usual when only 5 cubic feet were burned, the amount of light underwent a considerable diminution. But if the experiment were made of trying how much the volume of gas needed to be increased in order that 16 candles should be obtained, the ratio of that increased amount would not come out nearly so large as it appeared with the present system. He might add that, as one of the Committee, he tried over again some of the experiments he had made very carefully on the tolerance of variations of conditions such as might happen in actual practice. He made some of the experiments described in the paper. Placing the carburettor in warm water and packing ice upon it, and comparing the light the burner gave, he found the same result. The quantity of pentane vapour evaporated, even at the low temperature, was so considerable, and the steadiness of the light given was so great with these variations in temperature, that there was no measurable effect on the amount of light given. He had also carefully tried the effect of varying the height of the flame; and it was certainly the case that, whether it stood at such a height that the top just reached the lower edge of the screen, or whether it was nearly flaring out, the amount of light given out to the photometer was still constant. He could only re-echo the wish that the labours of the Committee might not prove to have been ineffectual, but that they might at last accomplish what had been so long wanted—the establishment of a standard of light which should give constant results, and be more satisfying than the extremely uncertain candle, both to the consumer and the gas company.

Mr. J. METHVEN said he had been watching the behaviour of the pentane standard of Mr. Dibdin during the last few months, and had compared it, in numerous experiments, against candles. He had had half-a-dozen operators at work, who had made 500 separate experiments; and it was found, as the result of the average, that the power of the burner was equal to 10·283 candles. Of course, it ought to be equal to 10 candles. He was glad to have the opportunity of stating the result of these experiments, because naturally an increase of nearly 3 per cent. on the 10-candle standard was almost equal to half a candle on 16-candle gas; and inasmuch as the extra enrichment of half a candle would cost the London Gas Companies about a halfpenny per 1000 cubic feet, it was obvious how they would be affected by this additional value being put upon the standard. Mr. Dibdin had referred to experiments made many years ago to determine the value of the pentane standard of Mr. Vernon Harcourt. He (Mr. Methven) remembered them well; and he had the pleasure of working with Mr. Harold Dixon on this subject. He recollected also the room in which they were made, and the photometer used. He had no doubt that the character of the photometer materially affected the results. That was pretty well established. The room was not built for a photometer-room; and, though large in area, it was low-pitched and poorly ventilated. Supposing at that time the pentane standard was equal to one candle, and admitting that Mr. Dibdin's ten-candle burner was ten times the power of this, how was it that he (Mr. Methven) now found, by his 500 experiments, that the Dibdin burner was equal to 10·283 candles? There must be something to account for it. Of course, it might be due to the candles. But he took the precaution to use 500 separate candles, not 250 candles cut in half. Six operators were engaged; and the difference between them was very small indeed. The highest result was 10·3, and the lowest 10·1 candles. It seemed rather hard on gas companies to have to submit to the introduction of a standard which was nearly 3 per cent. too high, taking the result of his experiments with 500 candles. Mr. Dibdin seemed rather to regret that the Committee had introduced any alteration in the mode of consuming the gas to be tested; but he (Mr. Methven) thought they had not gone far enough, because one very important matter in settling the question of the standards of light was to determine the photometer in which they were to be used. In the different official testing-stations, there were

various forms of photometers—the Evans box photometer, which had been converted and altered at the suggestion of the Gas Referees, and also the open Letheby photometer; and he believed there was a considerable difference in the results shown by the Dibdin lamp in these two instruments. His experiments were made with the open Letheby photometer, modernized, with a 60-inch bar. With regard to the effect of the humidity of the air on these flames, his experiments, made some years ago, conclusively proved that varying degrees of humidity of the air used for consuming the pentane had an effect on the light obtained from candles or a gas-burner. He thought the subject had been exhausted; but he was surprised a few days previously to find, in the "JOURNAL OF GAS LIGHTING," a report of some experiments by a German scientist on the effect of the humidity of the air on the Hefner standard. [See *ante*, p. 124.] They seemed to have been very exhaustive; and they entirely corroborated his own results. This seemed to show that some correction for humidity should be made. It appeared that, during the different months of the year, the amount of light varied to the extent of 3½ per cent.; and in one or two months the variations were as great as 5 per cent., owing to the different proportions of aqueous vapour in the atmosphere. Without casting any reflection on the manner in which the Committee had carried out their experiments, he thought the importance of the subject required that further investigation should be made before a new standard was introduced. They wanted a standard which was beyond suspicion. Candles were not reliable; and gas makers would hail the introduction of a standard which would remove the vagaries with which they had been troubled so long.

Mr. CADET said he had used the pentane argand—both the two and the ten candle—during the past two years as a standard for photographic purposes. In such cases, they did not expect to work to three places of decimals of a candle; but, as far as they could observe, using ordinary care, they were unable to notice any difference when testing with the pentane argand.

Mr. LLOYD asked if Mr. Methven could state the largest difference in the results found by the individual operators who made his experiments. These differences might, he said, be large, and yet the average of the differences between them might not be great.

Mr. METHVEN regretted that he had not the figures which would enable him to answer the question; but the average difference, and the mean of the whole, was what he had stated. The candles were all certified by the Gas Referees.

Mr. LLOYD said he had not got any farther, as he wanted information as to the differences between individual tests. He was himself for many years a gas examiner, but was one no longer; and so he spoke simply as one of the public. Everyone in London was interested in having a reliable standard for testing the gas he used and paid for; and the present system was an absolute farce—the differences between the standards used being so great. Even Mr. Methven said the present standard was not reliable. But the Gas Companies were not content to take a standard which was more reliable than the one now in vogue, but were asking for one which was absolutely perfect. If they waited for this, they would make no progress whatever. The Government ought to look after the interests of the public; and this would be best done by not interfering with scientific questions, on which scientific men ought to be the sole authority. If the Government would select gentlemen to fill the position of Gas Referees who would put as much knowledge and ability into the work as Mr. Vernon Harcourt did, and have a fair number of them, all scientific questions might be left to them, and they would not be bound down by Act of Parliament to something which was proved to be unscientific. With regard to the statement that the result might be affected by photometry, it simply amounted to this—that any scientific operation, if not conducted under proper conditions, did not give accurate results. But these conditions should be laid down by scientific men, not by the Government or members of Parliament, who did not pretend to be scientific experts.

Colonel CUNNINGHAM thought the paper had brought before the meeting a standard of light which he hoped might prove to be of much wider use than the purpose for which it appeared to have been invented—the testing of London gas. It might be used for testing the illuminating quality of other materials, such as petroleum, or for photographic exposures, or for other scientific purposes. He presumed that the material burned could be obtained beyond suspicion; but not much had been said about the medium in which it was burned, which might greatly affect the light. As regards the air, the chief differences would be pressure, heat, and hygrometic quality. A considerable range of temperature seemed to have been tried; but, as regards pressure, he gathered that the only variations referred to were those found in London. Now, both in this respect, and also with regard to humidity, much greater differences were found in other parts of the world, where, perhaps, this standard might be useful. In India, there were stations at an elevation of 7000 feet; and the standard might have to be used in a mine 3000 feet deep. In hot countries, there was sometimes hardly any moisture in the air, whereas at other times it was perfectly saturated. To go back to the pressure, this must affect the quantity of oxygen supplied to the flame; and there were other ways in which the light might be affected by the state of the atmosphere, such as the amount of dust or fog present. If the standard of light and the thing to be tested were both compared at the same time, the conditions being the same for both would not be material; but if it were compared with an incandescent material enclosed in a glass vessel, the state of the air might affect the result a great deal. Fog and dust would also have varying effects according to the distance through which the light had to pass.

Mr. CAMPBELL said a point which had not been touched upon was the presence of carbonic acid in the air. In July or August last, a series of researches were made in Germany on the amyl-acetate standard, and also on Mr. Harcourt's pentane standard, under varying pressures and different conditions, as to the amount of moisture and carbon dioxide; and it was found that the influence of the latter element was very great. He believed the addition of 1 part in 1000 parts made a difference of 7 per cent. in the amyl-acetate standard. He did not know whether the experiment had been made with the pentane standard; but it seemed very important to consider it, especially seeing that these standards might be used in badly-ventilated rooms. As far as he remembered, the experiments showed that the atmospheric pressure was not of importance.

Mr. GRAFTON referred to some former experiments by Mr. Dibdin, which seemed to show that his light was equal to 16·7 candles by Mr. Harcourt's one-candle standard and Mr. Methven's two-candle standard, while these two agreed in returning the gas as 16·3 instead of 16·7 candles. Mr. Dibdin put down the 0·4 difference to variations in the candles; but he (Mr. Grafton) took it that this was included in the average, and that 0·4 was a figure which ought to be recognized, since, with 16-candle gas, it made Mr. Harcourt's standard 2·4 per cent. too high, which would be exaggerated ten times when they came to Mr. Dibdin's lamp. He had conducted a large number of tests—about 3000; and he could not get it to average ten candles. He therefore thought there must be something radically wrong somewhere. He had also to complain that the chimneys for Mr. Dibdin's lamps were not cut off at right angles to their length, and therefore canted over when set up. He had no other fault to find with the lamp, except that it was too powerful.

Mr. T. S. LACEY said he had used the Dibdin standard in his ordinary daily work ever since it was first brought out, and found it very convenient and accurate. The paper was really on a standard which was constant; and he did not think they need discuss whether it represented any exact number of candles. The amount of light given by it was definite, whereas that from a candle was not. No one could say what an average candle was; and one could only get at an average by testing some thousands of them. By this standard they would be able to actually test candles. The value of a standard which was invariable was apparent to everyone; but he thought it would be a great pity to make a 16-candle standard lamp. The 10-candle standard was very handy, and one could take the readings direct from the bar without calculation; but this could not be done with a 16-candle standard, unless one had a special photometer-bar. He considered the Committee were thoroughly competent; and he hoped the question would not be re-opened.

Mr. HEARSON asked if pentane could be readily obtained, and if there would be any difficulty with regard to its carriage, on account of its inflammable nature.

Mr. DIBDIN, replying to the discussion, said he had not found any difficulty in procuring pentane; and it generally came by carrier. It was no more dangerous than ordinary benzolene or ether, or many other things which were systematically conveyed about the country. Taking, in order, the points raised. Mr. Methven had stated that an average of 500 experiments gave a value of 10·283 candles for the pentane ten-candle standard. Against that he had to place his own experiments, which numbered about 2000; while those made by the members of the Committee and others must have amounted to about 10,000. So that there were about 12,000 against 500. He could not cavil at Mr. Methven's results; but an average derived from 10,000 or 20,000 experiments must outweigh an average of 500. The question of photometers could now be settled without going to Parliament, because the Gas Referees had full powers; and he believed it was understood, by all persons interested in the question, that when the standard was settled the Referees would, once for all, prescribe the photometer. His own experience was that, if a photometer were well ventilated, it did not matter whether one had a bit of wood at the back or a velvet curtain, or something in front or at the ends, so long as the eye of the observer was screened from lights, and reflection from extraneous surfaces on the screen was avoided. The cabinet work did not matter. He preferred to burn lights in the open; but this was immaterial. However, to surround the lights with upholstery did not seem to him the best way of proceeding. When they had candles burning in a heated box, with insufficient ventilation, they could make them do whatever they pleased. This was exactly what had been done in some of the experiments referred to by Mr. Grafton. In some of his results, he obtained an average of 16·3 candles as the value of a certain flame with the Methven two-candle screen, as against 16·7 candles as an average of all the results with candles. But this average of 16·7 was produced by including certain results obtained in a room purposely heated to a temperature of over 90° Fahr.; and

the candles behaved in such a way, owing to the rapid volatilization of the sperm, that they began to smoke, and gave less light. Thus the amount of the sperm consumed was made to appear higher; and in many cases the 16·3 average, when tested by the candle itself, appeared to be up to 18 or 19 candles. He therefore had excluded all the results which came over 17·5. Thus the Harcourt lamp, the Methven screen, and the candle fairly agreed, excluding results which were obviously incorrect—the reason being known in many cases; and he considered he was quite justified in doing this. He was obliged to Mr. Cadet and Mr. Lacey for their support. Colonel Cunningham seemed to have a notion of carrying a standard of light all over the world. This was a grand idea; but the Board of Trade Committee recommended the adoption of his standard simply as a working standard for testing gas in London—not as an absolute unit of light to be used everywhere. His own opinion was that it was the best standard for any place, under present known conditions. What would be the variation at an elevation of 7000 feet, or down in a mine, he had not had an opportunity of trying. But Mr. Vernon Harcourt had made some experiments with the one-candle unit on the top of Ben Nevis, against the light of an incandescent electric lamp; and he believed that the variation was very little, if any. If this were the case, probably the same result would be found with the ten-candle standard, as the same argument applied. The effects of dust and fog were eliminated to a great extent by the fact that the distance between the standard and the light to be tested was usually very small, so that the fog would have to be considerable before any readable difference would be introduced. Mr. Grafton also raised the point that his chimneys were not always nicely ground at right angles. But if anyone choose to purchase something which was not what it ought to be, he must take the responsibility. He was glad to hear Mr. Lacey recognize the fact that the Committee had done their best to arrive at a practical solution of the question. Altogether, he thought the tone of the discussion was such as to justify the decision at which the Committee had arrived.

The CHAIRMAN then proposed a vote of thanks to Mr. Dibdin. In doing so, he said that anybody who had ever had to do with photometry by candles would agree that the sooner this method was got rid of the better. They must recollect, however, that they had to educate members of Parliament, who were the most ignorant people one could meet in a day's march. If they could get them to vote for the introduction of a proper standard, no one would be more rejoiced than himself. He could not say that he looked upon the Dibdin standard as a scientific one. He thought the unit of light would eventually have to be an incandescent solid of some kind. But for purposes such as gas testing it was the most convenient and practical one at the present time. Everyone who had watched this question as he had done for a great many years would testify with what care Mr. Vernon Harcourt had worked out the details of the pentane standard. In the original form, it was a naked flame; and he must confess that he liked an open flame better than one enclosed in a chimney, because there was an amount of uncertainty about the absorption of glass which one could not be sure of finding out correctly. It might absorb or it might not; and it depended upon the maker of the glass what kind of chimney they had. This might make a slight variation, which would materially interfere with the results for scientific purposes. Colonel Cunningham's remarks were worth attention; and he (the Chairman) should have been glad of a standard of light at an altitude of 10,000 feet, where the air pressure was only equal to 20 inches of mercury. But he did not know what would happen with the pentane standard under such circumstances—very probably it could be so regulated as to be satisfactory. The "JOURNAL" article to which Mr. Methven referred was an excellent one, and well worth reading. One photometer ought to be as good as another if it were properly used; it all depended on that. But if they used a grease-spot, there were so many pitfalls open, and so many precautions had to be taken to prevent error, that he preferred Mr. Vernon Harcourt's method of screens. But there was not time to enter into this question, or some others he might have referred to. He hoped the discussion might help to educate members of Parliament, so that there might soon be a satisfactory standard for testing London gas.

The vote of thanks was unanimously accorded.

PUBLIC LIGHTING BY INCANDESCENT GAS-BURNERS.

The last Transactions of the Belgian Association of Gas Managers contain a "Note" by M. Rouilly, giving the results of a trial of incandescent gas-burners, with the view of ascertaining whether or not there would be any advantage in employing them generally in the public lamps. His conclusions were not favourable. The lamp employed was of the ordinary round kind, with a reflector; and it was completely closed except at the top, where there were apertures to carry off the products of combustion. The burner was secured, as far as possible, from the effect of vibrations by being supported on a spring; and the mantle was attached to its ring by an asbestos thread. There was a corrugated glass chimney; ordinary glass not being equal to resisting the sudden variations of temperature. The burner was lighted from the top of the lamp. Altogether, eighteen lanterns were fitted with incandescent burners; thirteen of them being placed in streets where there was considerable traffic, and five in a square where there was little or no shaking. Great difference was found in the quality and working capacity of the mantles. Some lasted 1000 hours; whereas others quickly lost power after from 200 to 300 hours' use. Twice as many mantles were broken in the streets as in the square. Each burner was regulated to consume 100 litres (3·5 cubic feet) of gas per hour; and the annual consumption would be, in round numbers, 382 cubic metres of gas, costing 28 frs. 65 c. During a three months' trial, 31 mantles had to be replaced; the average life of a mantle being 618 hours. Only three glasses were renewed. In making an estimate for a year, it was reckoned that six new mantles would be required for each burner, costing 15 frs.; the expenses of altering and fitting the lamp would involve an annual outlay of 8 frs. 50 c.; cleaning, &c., 3 frs.; and sinking fund for first cost of alterations, 3 frs. 50 c.—making with the gas a total of 58 frs. 65 c. The ordinary public lamps fitted with batswing burners are rated for 200 litres (7 cubic feet) of gas per hour; and they cost 57 frs. 30 c. each per annum. The difference in their favour, therefore, is 1 fr. 35 c. These burners give the light of 1·6 to 1·7 carcels (say, 15 to 16 candles); whereas the incandescent lights, with the glass chimneys, had an illuminating power of 2·5 to 3 carcels, or from 24 to 29 candles. Consequently, an addition of, roughly, 10 to 14 candles in illuminating power would cost annually 1 fr. 35 c. per burner. The reduction in the cost of gas, from the smaller quantity employed, would not, it was estimated, cover the outlay for maintenance. In the case of the lighting of an entire town, the expenses would be increased by the extra attendance and attention needed. On the whole, the conclusion come to by M. Rouilly, as the result of his experiment, was that the incandescent system of gas lighting is not practicable for public thoroughfares.

RECENT DEVELOPMENTS IN GAS-ENGINES.

At the Ordinary Meeting of the Institution of Civil Engineers last Tuesday, a paper was read on "Recent Developments in Gas-Engines," by Mr. DUGALD CLERK, Assoc.M.Inst.C.E.

The author stated that the theory of the gas-engine outlined in a paper read by him before the Institution in 1882* was now generally accepted; while the stratification theory had vanished. Great advances had since been made in gas-engine construction; and the heat efficiency of such engines had been much improved, while their dimensions and power had increased. Engines working on the "Otto cycle" had been proved to be the best adapted of all yet invented for present needs; and their popularity had gradually led to the extinction of other types. The mechanical development of the Otto type was illustrated by the comparison of drawings of an engine built thirteen years ago with those of one recently constructed. The advance in heat efficiency was almost, if not completely, due to increase in the pressure of compression before explosion. It was shown that each step of diminished gas consumption of the Crossley-Otto engine was attended by an increase in compression. The results were summarized in the following table, showing the absolute indicated efficiency of Crossley-Otto engines of similar size since 1882:—

	Efficiency.	Pressure of Compression above Atmosphere. Pounds per Sq. In.
1882-88	0·16	.. 38·0
1888-94	0·19	.. 66·6
1894	0·25	.. 87·5

These results showed that economy increased with the compression; but it was open to question whether the increased compression completely accounted for the improved performance.

To test this, the author had calculated, by the formula $E = 1 - \left(\frac{v}{v}\right)^{\gamma-1}$, the theoretical efficiency of an air-engine in which no practical loss occurred—the air-engine having the same ratio of compression space as the actual gas-engine. These theoretical efficiencies, as well as the actual efficiencies obtained in the gas-engine, were shown in a table, from which it appeared that the economy had improved, chiefly on account of the increased compression. It was noted that in every case the actual indicated efficiency obtained from the various gas-engines was about one-half that which would have been given by an ideal air-engine following the same cycle in a perfect manner without loss to the sides of the cylinder. Also, that the actual efficiency improved more rapidly with the increase of compression than did the thermo-dynamic advantage due to the compression. Thus, when the theoretical efficiency was 0·33, the actual experimental efficiency was $0·33 \times 0·45 = 0·15$; and with the theoretical efficiency 0·39, the actual efficiency was $0·39 \times 0·48 = 0·19$; while with 0·428 theoretical efficiency, the actual efficiency was $0·428 \times 0·58 = 0·25$. The ratio of actual to ideal efficiency thus rose with increase of compression from 0·45 to 0·58; and this, it was stated, meant that with higher compressions, two advantages were obtained—the thermo-

* An abstract appeared in the "JOURNAL" Vol. XXXIX., p. 648.

dynamic advantage, due to improvement in cycle, and a further advantage due to diminution of the proportional loss of heat to the cylinder-walls.

In comparing the earlier with the recent Crossley-Otto gas-engine, it was pointed out that the great differences between the two engines which resulted in the superior economy of the later, were found in: (1) The abandonment of the flame slide-valve ignition, and the substitution for it of ignition by an incandescent tube of metal or other material; (2) the diminution in the relative volume of the compression space; (3) the improved proportioning of the valves and ports in order to minimize the throttling of the charges during the inlet period, and the back-pressure of the exhaust gases during discharge. This statement was illustrated by reference to numerous indicator diagrams. The author described his tests of the new Crossley-Otto scavenging engine; stating that scavenging possessed practical advantages quite apart from improvement in gas consumption.

Otto gas-engines, constructed by Messrs. Andrew and Co., of Reddish, and by Messrs. T. B. Barker and Co., of Birmingham, were also described and illustrated; and the various peculiarities of the different Otto-cycle engines were pointed out. Various self-starting gears were described.

From a mechanical point of view, the Otto cycle was a very imperfect one, allowing at most an impulse for every two revolutions of the crank-shaft for each single-acting power-cylinder. But the mechanical imperfections of the engine had until now been more than compensated by the simplicity of the single cylinder and piston, and the readiness with which the practical conditions of charging, exploding, expanding, and exhausting could be made to comply with the requirements of economical working. The great difficulty of the problems involved in "impulse-every-revolution" gas-engines was then referred to; and the author described several engines which had been designed with a view to overcome these difficulties. In the first engine built by the author, early in 1878, there were two cylinders, each having a diameter of 6 inches, with a length of stroke of 8 inches—one a pump-cylinder, and the other a motor-cylinder. The pump-crank followed the motor-crank at right angles; and it pumped the mixture of gas and air into an intermediate reservoir through a check-valve. From this reservoir, the explosive mixture was supplied to the motor cylinder by means of a slide-valve, and was compressed in the reservoir to a pressure of 70 lbs. per square inch above the atmosphere. The motor piston moved back to the end of the cylinder, leaving only a mechanical clearance; and the exhaust-valve was shut a little earlier, in order to cushion the piston, as was done with steam-engines. The motor piston moved forward from the end of its stroke about 2 inches, taking in the compressed mixture from the reservoir. The slide-valve then cut off the supply; and ignition was effected by an incandescent platinum cage carried in the slide. The engine, which was exhibited at the Royal Agricultural Society's show at Kilburn in 1879, was, the author believed, the first compression gas-engine working by explosion ever built which gave an impulse for each revolution of the crank-shaft. The difficulties which prevented the success of this type of engine were described. The author's 1881, 1886, and 1889 engines, as well as the "Differential" engine and the "Cycle" engine of Mr. Atkinson, were similarly dealt with.

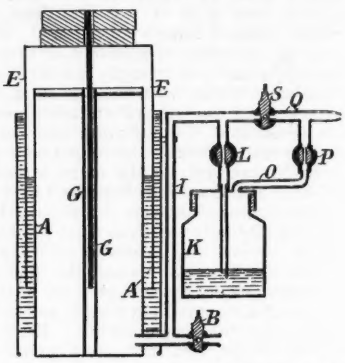
The author then considered the modifications still to be made in the indicator-diagram of a gas-engine, to further increase its heat-efficiency; and in this he particularly referred to the Otto cycle, although he stated that it was to be remembered that "impulse-every-revolution" engines could now be arranged to produce any of the results brought about by the Otto engine. It was pointed out that the actual indicated efficiency of a gas-engine increased with the theoretical efficiency, and that the actual efficiency varied between 0·45 and 0·58 of the theoretical efficiency. It was also stated that the indicated efficiency increased with the dimensions of the engine, other things being similar, when the ratio of compression space (and therefore the theoretical efficiency) remained constant. Thus an engine having a cylinder 9½ inches in diameter, with a length of stroke of 18 inches, had a theoretical efficiency of 0·40, and gave an indicated efficiency of 0·19 or 0·47 of that theoretically attainable. An engine having a cylinder 14 inches in diameter, with a length of stroke of 25 inches, of which the theoretical efficiency was 0·41, gave an actual efficiency of 0·277—that was, 0·675 of the theoretical efficiency. The actual efficiency, instead of being only 0·47 of the theoretical, increased to 0·675 without practical change in the compression. This comparison proved that efficiency increased with the dimensions. It was pointed out that a limit was reached to the increase of efficiency due to increase of dimensions, and the conditions were calculated. It was shown that further economy might be obtained by increasing the compression and expansion; but it was considered that, for high compressions and large gas-engines, it would be advisable to adopt the compound principle, although the conditions of success, for compound gas-engines, were not yet fully understood.

In conclusion, the author considered that the gas-engine would yet assuredly be applied upon railways and to ships, just as it was now used in factories. Its principles were better understood; and engineers were daily improving their knowledge of the properties of flame, and the means of harnessing flame instead of steam.

REGISTER OF PATENTS.

Testing Gas and Other Pipes.—Purves, D., and Morton, R., of Edinburgh. No. 1972; Jan. 29, 1895.

This gas and air testing apparatus consists of a holder A to be charged with gas or air. To do this, a stopcock B near the bottom is opened; and by gently lifting the drum or float E, air is drawn in; or, if to be charged with gas, a pressure above 1¼ inches will be sufficient to lift the drum or float. On shutting the stopcock, the holder can be adjusted to any pressure desired by means of weights. A guiding-rod working in a tube G, and supported at the top by a plate, keeps the drum in position. A tube I is attached behind the stopcock B, and carried to a tell-tale K, formed in the shape of a glass bottle. A stopcock L is fixed on the tube immediately at the top of the tell-tale; and from this stopcock, a tube enters and dips into fluid about ¾ inch—a suitable air-space being kept above the level of the fluid.



Another tube O, on which a stopcock P is fixed, leaves the top of the tell-tale K, and is attached to the tube Q connected to the pipes to be tested. A bye-pass arrangement, with a stopcock S, connects the two pipes I and Q, so that air under pressure in the holder is passed into pipes under test without disturbing the fluid in the tell-tale; the stopcocks L and P being shut. When the air in the pipes is compressed equal to that in the holder, the stopcock S is shut; and the two stopcocks L and P connected to tubes attached to the tell-tale K are opened. If there is a leak, the air pressure taken off the pipes under test is replaced by air from the holder A, which, passing down the tube M in the tell-tale, forms into air-bells when passing through the fluid.

Gas-Engines.—Binns, J. F. & H. G., of Luddenden. No. 4116 Feb. 26, 1895.

This invention—so far as it relates to gas-engines—consists: (1) In forcing out of the compression chamber the exploded gases, by means of an eccentric with a toothed wheel on the crank or crank-pin, geared with other wheels to a stationary wheel on the crank-shaft. As the shaft revolves, a rotary motion is given to the eccentric, which revolves once while the crank-shaft revolves twice. Therefore the piston which is coupled by the connecting-rod is caused to move into the compression chamber at the proper time, and thereby forces out the exploded gases, and makes room for a larger charge of gas. (2) The use of a check-valve to prevent gas from flowing through the hole between the main and the gas-bag while the engine is taking in a gas supply from the bag. The valve is pivoted on centre points, with a wing or flap covering the hole; and it is so constructed as to be closed by weight while the engine is drawing in a supply of gas from the bag.

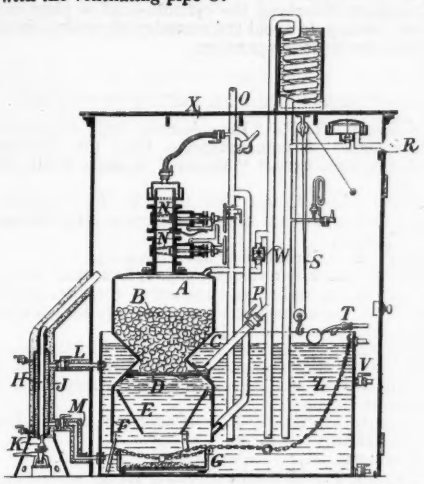
Producing Acetylene Gas.—Lake, H. H.; communicated from E. N. Dickerson, of New York. No. 11,848; June 18, 1895.

According to the claim of the patentee, this invention relates to a "process of manufacturing gas, which consists in automatically bringing into contact a solid and liquid material which by their union form a gas, and in automatically supplying an excess of water from a source external to the apparatus, thereby maintaining a constant minimum level in the apparatus, and governing the same by the consumption of the gas."

In the illustration, A represents a receiver for containing the calcium carbide. The chamber has a contracted lower delivery opening, as at the bottom of the cone C, below which is the grate D, upon which the material falls in such a way as not completely to fill the "again expanding portion" of the generator, which is practically hour-glass in shape. The lower chamber F is of suitable area to contain any excess of generated gas. A suspended conical guide E is placed in the chamber F; and, since the action of water on calcium carbide precipitates lime, such lime will fall through the guiding chamber E into the tray G, and can be drawn out beneath the water in the apparatus by the chain shown, and then raised by tackle S, and so swung out of the apparatus. The water-tank Z, automatically fed to a proper height by the float-cock T, surrounds the generator, and also serves as a seal to the various pipes dipping into it.

The chamber A is fed through valves opening by means of hand-wheels, so arranged that only one of them can be screwed out at once. The upper end of the feeding-tube may be closed by a cap, supported upon a flexible tube connected with a ventilating-pipe O. This pipe, also serving to ventilate the room X, is provided with a door Y, in which the whole apparatus may be placed. At about the level of the grate is the gas-escape pipe P, which opens into a pipe dipping below the surface of the water to about the lower level of the chamber F. This service-pipe may pass through a condensing chamber, whence the condensed water (if any) will fall again into the water of the receiver. The gas passes off by the service-pipe R. A pipe is also provided connecting with the upper part of the chamber A; and in

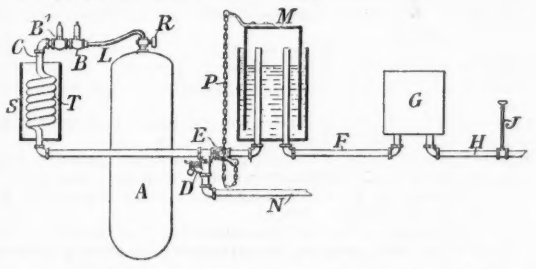
this is a check-valve W, opening into the delivery-pipe. This pipe also connects with the ventilating-pipe O.



The entire chamber X, and the water, may be readily warmed, as follows: K represents (preferably) a Bunsen burner, fed from the generated gas. The products of combustion from it pass upward through the pipe H, which opens into another pipe delivering into the chamber. Surrounding the pipe H is the concentric pipe J, which connects by the pipes L M with the upper and lower portions of the water in the tank Z. In this way, circulation of warm water is maintained, and the room is kept warm.

Supplying Acetylene Gas.—Lake, H. H.; communicated from E. N. Dickerson, of New York. No. 11,8488; June 18, 1895.

In the course of his specification, the patentee says: "The invention relates to apparatus for supplying illuminating gas to houses or other places, and is especially applicable to the practical utilization of liquefied acetylene gas. I have discovered that such gas can be liquefied, under suitable conditions, at reasonable pressures, and subsequently utilized for illuminating purposes. Preferably, the gas should be mingled with a suitable proportion of air before burning."



In the illustration, A represents a liquefied gas-receiver; B, an automatic reducing-valve; T, an expansion-coil in a brine-tank; E, a regulating-valve; M, a gasholder; G, a mixing device; J, a burner; and D, a safety-valve.

The liquefied gas is contained in the receiver A, of which several may be simultaneously connected to the pipe if desired, or they may be consecutively connected to the gas-pipe L. The gas, which will exist in a liquid form at ordinary temperatures at a pressure of less than 1000 lbs. to the square inch, on escaping from the liquid, passes through the cock R to the pipe L and to automatic pressure-reducing gas-governors B, of which a series B B¹ may be employed, if desired, so as to reduce the pressure to the point required for the holder. It is generally advisable to reduce the pressure by successive steps in a series of such valves. The expansion of the liquid to a gas produces cold, which may be utilized by causing a pipe C to pass through the brine-tank S; and the cold so produced may be utilized in any well-known way, or the expansion-coil T may be itself placed in a refrigerator as a source of cold. The gas passes by the pipe C to the holder M, which controls the stopcock E on the inlet, so as to shut off the pressure when the holder has reached its capacity. The holder itself is weighted to the pressure adapted to operate the air-mixing machine G, to which the gas flows by the pipe F, and from which it passes by the pipe H to the burner J. This air-mixing machine adds to the gas a proportionate amount of air—a suitable proportion being 55 per cent. of acetylene gas and 45 per cent. of air. In case of excess of pressure in the pipe C, a safety-valve D is provided, allowing the escape of such pressure through the pipe N to the open air.

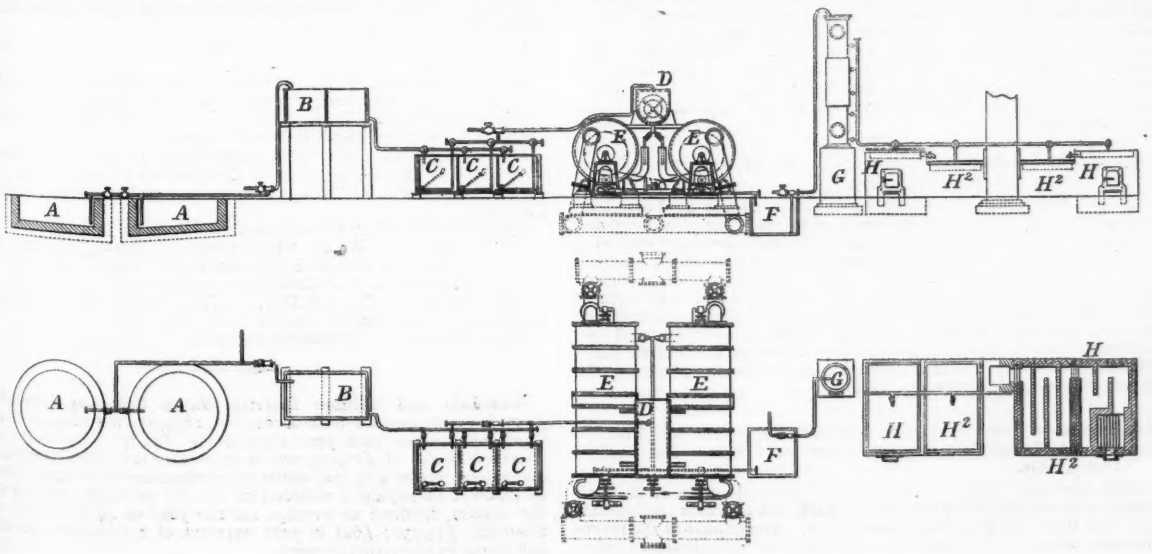
When in operation, the pressure of the gas is reduced by the reducing-valve to a reasonable amount; and it then enters the governing holder M. When this is filled, the entry-valve at E (which opens by its own weight) is raised by the chain P, so as to prevent further passage into the holder; while the holder itself automatically supplies the gas-main F, delivering through the mixer G to the burner. In case of any excess of pressure escaping through the valve B so as to endanger the apparatus, such excess may escape by the safety-valve D.

Alluding to his proposal, the patentee says: "I do not claim to be the first inventor of a regulating-valve for regulating the pressure delivered from liquefied gas—such idea being in common practice in refrigerating-machines. By the combustion of an illuminating gas, however, derived from a liquefied gas, a different condition exists—namely, the necessity of obtaining at the burner a substantially uniform pressure. If the consumption at the burner is uniform, and the pressure in the liquefied tank is substantially uniform, an intermediate regulating-valve will maintain a practically constant pressure on the burner. A liquefied combustible gas, so long as there is any liquid remaining, maintains at the same temperature substantially the same pressure; and it is the utilization of this law; to maintain on the combustion side of the regulating-valve a uniform pressure, that I accomplish by this invention. By this apparatus, the practical combustion of liquefied acetylene has been for the first time accomplished; and though it is desirable, for absolute uniformity of pressure, to have the valves B B¹ automatically moving, and to have the governor M, and for some purposes the air-mixer G, yet these parts are, in fact, immaterial for some uses of my invention. If, for instance, a burner J (or a number of burners) is to be lighted, the regulating-valve B can be set so as to supply the requisite pressure to the burner; and then the cock R being opened, the burners J will burn properly, so long as there is any liquid in the receiver A, provided the consumption be not so rapid as to greatly reduce the temperature in the receiver A."

Obtaining Cyanides from Gases.—Foulis, W., of Glasgow, and Holmes, P. F., of Huddersfield. No. 15,168; Aug. 12, 1895.

This invention relates to apparatus for use in obtaining cyanides from gases according to patent No. 9474 of 1892.

The apparatus consists of a neutralizing tank or tanks A, in which iron liquor is prepared (by dissolving iron scrap in hydrochloric acid), and from which the liquor is withdrawn by pipes which dip down into a portion of the bottom of the tanks at a lower level than the rest. The tanks for this purpose may have sloping bottoms, as shown. They are constructed of, or lined with, acid-proof material—such as fire-bricks, cemented with pitch. The pipes are connected to a steam-lifter, which effects the withdrawal of the iron liquor from the neutralizing tanks and discharges it into a storage tank B, from which it is drawn as required into precipitation tanks C. There it is mixed with alkaline carbonate (for example, carbonate of soda), so that carbonate of iron is produced, which falls to the bottom of the tanks C. The supernatant liquid is drawn off by means of jointed outlet-pipes, which follow the liquid as it descends in the tanks C. The alkali is then added with a sufficiency of water to the carbonate of iron in these tanks; the liquor being heated meanwhile by a steam-coil, or by steam blown directly into the liquor. Dipping down to near the bottoms of the tanks C are pipes in connection with a steam-lifter or equivalent device, by which the contents of the tanks are withdrawn and delivered



into a mixing chamber D, in which are stirrers—paddles on a rotating shaft. The liquor, with the carbonate of iron in suspension, passes from the mixing chamber D into horizontal rotary scrubbers E. The gas from which the ammonia has been removed, and from which the cyanides are to be separated, is passed through the scrubbers, and forms ferro-cyanide, which is pumped into a tank F, from which it is lifted into a settling tank or tower G, and thence is passed into evaporating-pans H H^2—preferably arranged in duplicate, one pan H^2 of each pair being over the flue, and the other pan H being directly over the fire. The thin liquor is passed into the pans H, and the thicker liquor into the pans H^2, which are subjected to a lower temperature; or the liquor may be pumped directly from the tank F into the pans H, and there evaporated to a certain extent, after which it is run into the pans H^2, and therein the liquor is completely evaporated. The cake obtained can then be treated as described in the 1892 patent.

Sun-Light Gas-Burners.—Thomas, W. J., of Denmark Hill, S.E. No. 15,430; Aug. 16, 1895.

This modified form of ceiling light consists of a combination of one or more domes or reflectors heated by the flames of corresponding gas-jets with or without baffle-plates placed over apertures in the dome or reflector. Cones are arranged to form passages or flues for the exit of fumes and gases; while other cones form passages or flues for the entrance of cold or heated air to the flames or jets. There is also a chamber having a baffle-plate or plates for preventing the passage of solid matter to the burners or jets.

Gas-Engines.—White, C., and Middleton, A. R., of Baltimore, U.S.A. No. 16,891; Sept. 10, 1895.

This engine belongs to the class in which an explosion takes place after every second reciprocation of the piston, or less frequently, as may be required by the conditions of the work; and after each explosion, the piston on its return stroke forces out the exploded mixture through a supplemental exhaust-port. Then on its outward movement it draws in a fresh charge, which is compressed on the next return stroke; and after this compression, the explosion takes place.

The engine is provided with a supplemental exhaust-port in the rear of the cylinder, controlled by a valve operated automatically by the same rod as that which controls the gas-inlet. In order to discharge the foul contents of the cylinder, it is necessary, first, that the supplemental exhaust-port valve be positively opened; and it is, of course, also necessary that it shall be opened at a certain time in the movement of the piston—that movement being its return after an explosion has taken place. In order to control accurately the operation of the valve covering the supplemental exhaust opening, and also to regulate the introduction of a fresh charge of explosive mixture by actuating the gas inlet-valve, governor mechanism is provided consisting of an operating rod, which extends along the side of the cylinder. Its rear end is guided in a projection from the cylinder; and the extreme rear end bears against a lever pivoted on a stud, and adapted to actuate the valve controlling the supplemental exhaust. The rod is provided with a spring encircling it, and having one end bearing against a collar on the rod. Its other end bears against the projecting part of the cylinder. The spring has a tendency to press the end of the rod operated upon towards the governing mechanism. The rod also has a projecting arm or stud adjustably secured to it. This is in contact with the stem of a valve which controls the gas-inlet, so that, through the operation of this single rod, the supplemental exhaust is operated and the gas-inlet also; and this operation is effected by very simple means, and by parts which, it is claimed, are not liable to get out of order.

Liquid Meter, Motor, or Pump.—Bernays, J., of Newgate Street, E.C. No. 18,675; Oct. 5, 1895.

This invention relates to the construction of a meter for measuring the consumption of water or other liquid, which can be modified for use as a motor engine, or if power be applied to some of its moving parts, it can operate as a pump for raising or forcing fluids.

To accomplish this, four cylinders fitted with pistons are arranged uniformly around a central space, wherein a rod rigidly connecting one pair of the pistons opposite to one another crosses at right angles; a like rod connecting the other pair. The middle point of the one rod is connected to that of the other rod by a link, the central point of which revolves in a circle, while its ends travel with the piston-rods in straight lines at right angles to one another. A circular slide-valve worked by the link governs ports leading liquid to and from the cylinders in suitable alternation and succession, so as to effect the measurement of the liquid introduced to the apparatus through suitable ports.

Intermittent Gas-Lights.—Rickman, W. B., of Leadenhall Street, E.C. No. 23,055; Dec. 2, 1895.

This invention relates to automatic apparatus of the kind described in patent No. 14,115 of 1895, employed on buoys or beacons, for giving flashing or intermittent lights; the gas which furnishes the flame being supplied for a time to the burner, and then for a time nearly stopped, and so on alternately. It has been found that, in employing apparatus so far constructed for this purpose, when the gas is suddenly supplied to the burner after temporary obscuration, there is at first not sufficient draught to cause an adequate supply of air for combustion; and consequently there is a smoky flame, which blackens the lantern glass. The object of the invention is to provide against this by rendering the supply of gas after obscuration gradual.

Gas-Engine.—Wise, W. L.; a communication from the Buckeye Manufacturing Company, of Anderson, U.S.A. No. 23,113; Dec. 3, 1895.

This invention relates to the class of gas-engines in which each charge of gas is ignited by an electric spark, and in which the cylinder is cooled by a water jacket surrounding it. The objects of the invention are: First, to more effectively cool the end of the cylinder in which the explosion takes place; secondly, to enable the lime deposited by the water to be more readily removed from the interior of the water-space, and without disturbing the cylinder-head or plate carrying the sparker; and, thirdly, to avoid the necessity of packing the main head or ring against the explosion pressure.

APPLICATIONS FOR LETTERS PATENT.

819.—Thompson, W. P., "Incandescent body for gas or vapour lamps or burners." A communication from the Continental-Gas-Glühlicht-Actien-Gesellschaft "Meteor," vormals Kroll, Berger, and Co. Jan. 13.

841.—Breffit, G. W., and Treharne, F. G., "Furnace for producing coke, with or without suitable apparatus for collecting the bye-products." Jan. 13.

858.—Devis, A., "Carburetting air." Jan. 13.

882.—The Whessoe Foundry Company, Limited, "Preventing the freezing of gas in gas-mains, and apparatus therefor, and for carburetting gas." A communication from the Berlin-Anhaltische Maschinenbau-Actien-Gesellschaft. Jan. 13.

931.—Semple, J. K., "Electrical devices for igniting gas." Jan. 14.

975.—Holbrook, R., "Incandescent gas-burners." Jan. 14.

1022.—Rad, A. von, and Rosenfels, J., "Manufacture or production of cyanogen compounds." Jan. 15.

1116.—Rossbach-Rousset, F., "Production of acetylene gas for acetylene gas lighting." Jan. 16.

1129.—Knoefferl, F., "Producing light." Jan. 16.

1135.—Thomas, F., "Draught protector for incandescent gas-light." Jan. 16.

1136.—Kollm, F., "Incandescent body for illuminating purposes." Jan. 16.

1155.—Ford, T., "Chandeliers, gaseliers, gas pendants, and gas brackets." Jan. 16.

1168.—Anderson, R. B., "Gas-valves." Jan. 16.

1244.—Douglass, W. J., "Joints for pipes or tubes." Jan. 17.

1261.—Gummer, W., "Bye-pass connection for incandescent gas-lights of all kinds." Jan. 18.

1300.—Polony, C., "Production of a non-exploding mechanical admixture of oxygen and hydrogen." Jan. 18.

1332.—Luis, C. G., "Production of acetylene gas." Jan. 18.

1336.—Williams, W. B., "Gas-burners." Jan. 20.

1351.—Hawley, J., "Wood grids for gas-purifiers." Jan. 20.

1363.—Beal, W., "Mantles of incandescent gas-lights." Jan. 20.

1368.—Hewett, T., "Gas-burners." Jan. 20.

1401.—Naville, A. A., Guye, P. A., and Guye, C. E., "Electrical gas-reaction apparatus." Jan. 20.

1403.—Southgate Engineering Company, Limited, "Gas or air valves for regenerative gas-furnaces." A communication from J. Stewart. Jan. 20.

1417.—Bunn, P. C., "Utilizing Weldon mud and similar wastes produced in the manufacture of alkalies." Jan. 21.

1439.—Love, G., "Combination apparatus for conveying coke." Jan. 21.

1475.—Harrison, R., "Production of gases and vapour from mineral oils and other hydrocarbons." Jan. 21.

1480.—Brewer, E. G., "Electric gas lighting apparatus." A communication from H. C. Farquharson and D. F. Root. Jan. 21.

1496.—Boult, A. J., "Water-meters." A communication from T. Derichs and H. Frères. Jan. 21.

1502.—Brunner, J. T., and Brunner, H., "Utilization of coke-oven and other rich gases for manufacturing or heating purposes." Jan. 21.

1521.—Wilsmore, N. T. M., "Incandescent gas or oil lighting." A communication from D. Little. Jan. 22.

1576.—Denayrouze, L., "Incandescent lighting with an intimate mixture of gas and air." Jan. 22.

1593.—Cliffe, W. A., "Interchangeable oven for either gas or oil." Jan. 23.

1620.—Robertson, G., "Heating, cooking, and lighting appliances." Jan. 23.

1646.—Arnhold, H., "Gaseliers and other pendant lights." Jan. 23.

1648.—Young, D., "Gasifying petroleum spirit and analogous liquids." A communication from F. Aschner. Jan. 23.

1667.—Fairley, T., "Manufacture and purification of ammonium nitrate and other salts." Jan. 23.

1668.—Fairley, T., "Manufacture of ammonium nitrate and sodium salts." Jan. 23.

1681.—Wheatley, W. H., "Incandescence bodies for illuminating purposes." A communication from F. Woernle. Jan. 23.

1682.—Wheatley, W. H., "Incandescence bodies for illuminating purposes." A communication from C. Schmid. Jan. 23.

1750.—Mewburn, J. C., "Fuel briquettes or blocks." A communication from La Société Anonyme du Combustible Intensif. Jan. 24.

1789.—Söhnlein, J., "Oil, gas, and other motive-power engines." Jan. 25.

1810.—Talbot, H., "Incandescent gas-lamps." Jan. 25.

1812.—Thompson, W. P., "Gas-stoves for heating, cooking, and other purposes." A communication from R. G. Finlay. Jan. 25.

1817.—Walker, C. C., "Enriching or carburetting gas." Jan. 25.

1833.—Jones, A. C., and Day, J., jun., "Chandeliers, gaseliers, gas-pendants, gas-brackets, and other hanging lamps." Jan. 25.

1841.—Stiens, P., "Incandescent mantles." Jan. 25.

Weardale and Shildon District Water Company.—Including £5571 brought forward from December, 1894, the net revenue of this Company for the past year amounts to £32,878. Deducting the interim dividend of £12,375, and income-tax £1030, there remains an undivided profit of £19,472, which is recommended to be appropriated as follows: In paying a dividend of 12s. 6d. per share, making with the interim dividend an average for the year of 4¾ per cent., and absorbing £13,750; £621 in part payment of a duplicate pipe-line; and £5101 to be carried forward.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Selling v. Holding Stocks of Sulphate of Ammonia.

SIR,—The thanks of the gas fraternity are due to Messrs. Bradbury and Hirsch for their admirable "Annual Review of the Market for Sulphate of Ammonia." The last [noticed in the "JOURNAL" for Jan. 28], although very instructive, is certainly rather depressing reading; but it contains, in addition to much valuable information, lessons which, if heeded, may prevent the recurrence of such a disastrous time as the present.

There are repeated and emphatic references to the practice of allowing stocks to accumulate. Messrs. Bradbury and Hirsch say in one part: "In order to stem the tide of events, the larger manufacturers—more particularly those in London—withheld their stocks . . . in order, if possible, to maintain prices—to the great advantage of the Scotch and other makers who pursued a different course." Again: "Shrewdly gauging the position, *and presuming upon the large and increasing stocks*, operators throughout the year persistently 'beared' the market. . . . . They have been most successful on a falling market." The italics are mine. Again: "During the later months of 1894, makers had shown great reluctance to follow the drooping market, and had allowed stocks to accumulate;" "with stocks accumulated in makers' hands;" and so on.

From this it seems that the accumulation of stocks was the cause of much of the mischief. It is quite true that, with the agricultural depression, the increased quantity and the decreased price of nitrate, a fall in prices was inevitable. But has not the policy of allowing sulphate to accumulate caused nitrate to fall more than would otherwise have been the case, which again has reacted on sulphate, and brought it down to the lowest price ever realized. Sulphate has been sold this week at £8 2s. 6d., caused by a report that the largest makers who have an enormous stock—the quantity being well known to the market—have at last put it on the market at £8 or £8 2s. 6d.

Let me trace the recent history of this matter, which is generally accepted as accurate. In the middle of 1894, sulphate was selling at £13 15s. per ton—an exceedingly good price. The largest makers stood out for £14 (outstood the market, in fact), and accumulated a stock of several thousand tons, which was sold in October at about £13. Then followed the same policy. A second time they piled up a large stock, and sold again in December at about £11; and so on, with the result that the stock from time to time increased until at the end of 1895 it was greater than ever—a most unfortunate legacy for 1896.

It appears to me that the only safe policy is to sell sulphate as it is made. If that is done, the make of each year will be used and done with; whereas if the contrary course is taken, the stock carried over from one year becomes a burden upon the next, which not only necessarily, by its mere existence, depresses the market, but plays into the hands of the "bear" speculators, with the result of still further depressing prices.

It seems that there are men who will not learn by experience, who, notwithstanding glaring failures, still persist in trying to get a little more than the market price. For instance, the makers in question, even so late as the present month, were week after week standing out for £9, when the market price was £8 12s. 6d. They thus, time after time, bring disaster not only upon themselves, but on all other makers of sulphate, all gas shareholders, and all gas consumers.

GEORGE LIVESEY.

Reigate, Jan. 31, 1896.

The Relative Prices of Crude Naphtha and Benzols.

SIR,—Under the heading of "Tar Products," in your issue of Jan. 28, is what purports to be a reply to my letter.

My standpoint is simply this: A short time ago 30 per cent. crude naphtha was quoted at about 5d., and 90's benzol at 11d.—thus giving a margin of (say) 6d., including cost of manufacture and distiller's profit. At present, with 90's benzol at (say) 2s. 4d., and crude naphtha at (say) 10d., the margin is 1s. 6d.—*i.e.*, three times as large as before for almost exactly the same work.

Assuming, for argument's sake, that this previous margin of 6d. was half for cost of manufacture and half for profit, the position of things would be that, the cost of manufacturing remaining approximately the same, the profit is increased as 3d.: 1s. 3d.—*i.e.*, the present profit of the benzol distiller is about five times as large as before the rise.

How is it possible that any logical mind can try to obscure the question by dragging in the cost of carriage, steam, casks, and delivery, which in no way are affected by the recent rise in prices?

Manchester, Jan. 30, 1896. HENRY SIMON.

P.S.—The matter is so totally inexplicable to me that one would think the present high prices of benzols must be due to some artificial handling; for if there were any prospect of this or similar prices being maintained, or of a further rise, surely makers of 90's benzols would long ago have been glad and ready to pay a higher price than 10d. for crude naphtha?

The Municipal Water Supply of Cologne.

SIR,—The first paper of the British Association of Water Engineers, "The Municipal Water Supply of Cologne" (*ante*, pp. 128, 177) will, I think, be most interesting to the readers of the "JOURNAL."

I notice that the wells are sunk into a deep permeable stratum of gravel below the vegetable soil. One would like to understand if the catchment area is under cultivation, and at what depth the water is taken—that is, how many feet of this natural filter of gravel are sufficient to produce a good potable water.

It is not quite clear why the water from the gravel filter should be so much harder than that from the Rhine; and I regret that the tables of analyses have been omitted from the reprint of the paper, and that the degrees of hardness of the Rhine water are not placed by the side of the hardness of the well water.

I shall be obliged if Mr. Biggs will kindly inform your readers if at any time the Rhine, rising suddenly, has not overcome the ground-water pressure, and entered the well. It is said that the walls of the wells are impermeable. But on a sudden rising of the river its influence is felt a long distance on either side. One would imagine there would be a mixing of the waters in time of flood.

I trust some of the ninety members of the Association may be inclined to communicate their ideas on this all-important question of water supply.

SUPERINTENDENT.

Jan. 31, 1896.

Obtaining Receipts from Workpeople for Wages.—In further reply to the inquiry on this subject in the "JOURNAL" for the 21st ult., a correspondent writes that he believes it is the practice of the Grand Junction Water Company's men, from the Superintendent, Resident Engineer, and foremen down to the labourers, to sign the wages-sheet every week. Those who are paid more than 40s. per week have a stamp affixed to the sheet by the Company. Our correspondent asks if "X. Y. Z." will kindly explain what good purpose is effected by exhibiting to every workman the amount his fellow-workman is earning per week, and how much overtime he is paid for. Is it not, he says, a cause of jealousy between really efficient workmen and duffers?

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.
Friday, Jan. 31.

(*Before Mr. Justice* MATHEW.)

The Incandescent Gas-Light Company's Patents.

To-day his Lordship had before him the action of *The Incandescent Gas-Light Company v. The Helion Incandescent Gas-Burner Company and Others*, which was brought by the plaintiffs to restrain the defendants from infringing several patents, numbered respectively 15,286 of 1885, 3592 of 1886, 586 of 1891, and 124 of 1893. They applied for damages and costs. It was stated, on behalf of the plaintiffs, that Mr. A. Connor had been instructed by the defendant Company to consent to judgment as asked. This having been admitted by the learned Counsel named, his Lordship directed the briefs to be endorsed to that effect.

Subsequently his Lordship, sitting with the Lord Chief Justice, had before him the case of *The Incandescent Gas-Light Company, Limited, v. The Sunlight Incandescent Gas-Lamp Company, Limited.* It was an application by Mr. C. E. E. Jenkins, on behalf of the defendants, for the advancement of a motion to commit the plaintiffs, under the following circumstances: The action was brought by the plaintiffs to restrain an alleged infringement of their patents. On the plaintiffs moving for an interlocutory injunction, Mr. Justice Wright did not make any order, except that defendants should keep an account until the trial, and that the plaintiffs should not, pending the trial, threaten the defendants' customers, or bring actions against them. The defendants had discovered that some of their customers had been threatened, and that in one case an action had been commenced by the plaintiffs. The defendants had therefore given notice of motion to commit the plaintiffs and their Solicitors for contempt of Court, in disobeying the terms of Mr. Justice Wright's order; and it was this application that it was now sought to advance. On behalf of the plaintiffs, it was urged by Mr. Walter that, inasmuch as the whole question of the validity of plaintiffs' patents and the alleged infringement would be decided in a trial which was fixed for the 10th of February, there could be no urgency. The Court refused to advance the motion; considering that no case of urgency had been made out.

Personal Injuries Caused through Main-Laying Operations. Remarkable Coincidence.

In the Queen's Bench Division, on Thursday last, the Lord Chief Justice and a special jury had before them an action in which Mrs. Mary Spillane, a widow, 53 years of age, carrying on business as a fruiterer, at No. 635, Commercial Road, sued Messrs. John Aird and Sons, to recover damages for personal injuries caused, as she alleged, through the negligence of their servants. The defendants denied both the injury and the negligence. Plaintiff's case was that in November, 1894, the defendants' workmen were engaged in laying a water-main in the roadway opposite her house, and that while they were picking up the road on the 6th of that month, and she was standing in her shop, a piece of flint flew up and struck her on the left eye, and caused her considerable injury, which was said to be permanent, and which had led to trembling paralysis. The extraordinary part of the case was that in the year 1886 the plaintiff received a similar injury, under analogous circumstances, to the same eye, through the action of defendants' workmen, who were in that year also employed in the neighbourhood of her shop. She made a claim for compensation on that occasion, and the matter was settled by the defendants paying £125, including costs. Under the present circumstances, Messrs. Aird defended the action, and contended that such a coincidence as was said to have occurred was almost incredible. Their suggestion was that the plaintiff was endeavouring to obtain compensation for the very injuries with regard to which she had already been indemnified in 1886. Their Counsel admitted that she might have been struck by a small piece of grit or stone in November, 1894; but they disputed the allegation that the left eye was struck, or that the injuries complained of had resulted. They also denied that their servants had been guilty of any negligence. There was considerable conflict with regard to the medical testimony given on the one side and the other, both as to the injury to the eye and as to the paralysis. At the conclusion of the evidence, the Lord Chief Justice asked that a doctor from each side might accompany the plaintiff into a room in the precincts of the Court, and examine her as to paralysis. They did so, with the result that defendants' doctor declared that she was not suffering from that disease, while plaintiff's

doctor was equally positive that she was. The Lord Chief Justice, in summing up, alluded to the status of the plaintiff, as, he said, the defence amounted to a charge of conspiracy. Referring to the expert evidence, he said that it might be that the extraordinary coincidence of the plaintiff having been twice struck had, unconsciously, prejudiced the minds of the experts acting on behalf of the defendants, who had been told the story of 1886. This was not the way in which expert evidence should be put before the Court; and it undoubtedly detracted from the value of the evidence. The jury, before retiring, asked to see the piece of stone by which the injury was said to have been caused, and also that they might see the plaintiff. It was agreed that the plaintiff, with one of her daughters, should accompany the jury to their room. After considering the matter for twenty minutes, a verdict for the plaintiff was returned, with £150 damages.

The Litigation between the Dublin Corporation and the Gas Company.

In the Queen's Bench Division of the High Court of Justice for Ireland on the 21st ult., Mr. P. O'C. White made an application to the Lord Chief Baron and Justices Johnson and Gibson, on behalf of the Dublin Corporation, that the Taxing-Master should be directed to review his decision in respect of two items of the plaintiffs' costs in the case tried before Mr. Justice Andrews in reference to the supply of gas to the public lamps. The verdict which the plaintiffs obtained was afterwards reduced, on a new trial motion, by the Queen's Bench Division. Mr. White stated that one of the items was 100 guineas for the preparation of case for proofs, perusing documents, examination of 2345 items of work in connection with 597 of the public lamps, and also an examination of orders given for the work. The Master had taxed this amount down to £75; and the Corporation contended that it should be further reduced to £35, they objecting that the items which made up this amount should be given in detail, as some of the matters had regard to questions in which the plaintiffs failed. A little discussion ensued, in the course of which Justice Gibson said he could not see how the taxation could be supported when the attention of the Taxing-Master was never directed to the point that this Court disallowed the items which were the subject of the trial to a great extent. It was agreed that the motion should stand over till the following Friday. On that day, the matter was again introduced by Mr. White to the notice of their Lordships, who had with them on this occasion Mr. Justice Holmes. Mr. White explained that the original action was for £308 0s. 2d.; and the jury found a verdict for £307 18s. 2d. On the new trial motion, the plaintiffs succeeded to the extent only of £147 10s. 8d.; and the Corporation succeeded to the extent of £160 9s. 6d. The Taxing-Master had proceeded on the basis that the verdict had not been disturbed by this Court. The first item to which he objected was: "Instructions for case for proof and for brief, 100 guineas." The Taxing-Master took off 30 guineas, and allowed the difference. Defendants contended that this was too much, and that £30 was quite enough. Justice Gibson suggested that the parties might agree to have the item fixed at £50. Mr. Blood (for the Company) assented; but Mr. White stated that he had no authority to consent. Mr. White also objected to an item of £19 14s. for a copy of a book of correspondence, &c., made for the use of the Judge. There was, he said, no rule which authorized such an allowance. Justice Holmes held that such a book was absolutely essential. The Court decided to alter the ruling of the Taxing-Master on the item of 100 guineas by reducing it to £50, and on the item of £19 by reducing it to £15, and gave no costs.

Abstracting Money from Automatic Prepayment Meters.

At the West London Police Court last Thursday, a lad, named Charles Parker, described as a paper seller, was charged in the first instance with being on the enclosed premises, No. 108, Westbourne Grove, for an unlawful purpose; and afterwards with stealing and attempting to steal money from an automatic prepayment gas-meter, the property of The Gaslight and Coke Company. Mr. Humphreys, jun., appeared to prosecute. On the 15th ult., the box of the meter in the passage of No. 108, Westbourne Grove, was found broken open, and lying on the floor; and the money placed in it was gone. A communication was made to the Company; and on the following day a new meter was fixed in the passage—two pennies being placed in the box to test it. On the 20th, one of the Company's fitters found the prisoner, who was on a ladder in the passage, at the meter, which was over the fanlight. He was asked what he was doing up there; and he replied that he was looking at the gas, and that it was all right. He was next asked who sent him; and he said something about the Gas Company. The fitter attempted to detain the lad; but he managed to escape over the wall. The meter was examined, and found to be damaged. On the next day, Parker was pointed out and arrested. He said: "I was put up to do the job. Someone told me it was easy. I had nothing to do with the other one." At that time the constable had not referred to the other meter. Arther Beckett, the Company's collector, said the damage to the meters was less than £2. Mr. Plowden treated all the charges as one offence, and sentenced the accused to three months' imprisonment with hard labour.

The South Staffordshire Water Company's Charges in Burton.

A test action came before His Honour Judge Smyly, Q.C., at the Burton-on-Trent County Court last Wednesday, in the case of the South Staffordshire Water Company *v.* Henry Mills Barrow. The plaintiffs (who sought to recover 15s. 6d. arrears of water-rate) were represented by Mr. Alfred Young; while the defendant, who is managing clerk to Mr. H. Goodger, the Clerk to the Magistrates, was unrepresented. The defendant, while not denying his liability for 14s. 6d., took a preliminary objection on the ground that the Court had no jurisdiction to fix the annual value of the premises he occupied; and he further contended that the plaintiffs were bound to charge their rate upon the annual value, meaning thereby the net rateable value, and not upon the rack or gross estimated rental. After a long argument, his Honour said the first objection was certainly a strong and, he thought, a valid one; but, as he did not wish to shirk pronouncing a decision on a case of so much importance by a side issue, he would allow the case to proceed, and give his decision on the objection and the merits of the action. Further legal arguments ensued, in the course of which it was incidentally stated that his Honour's decision would affect the whole of Burton, and that the present charges of the Company, which were based on section 33 of the Burton-on-Trent Water Act of 1861 (which the plaintiffs took over), had been made for the past thirty years. His Honour reserved his decision.

A Disputed Water Account.

Before his Honour Judge Edge, at the Crediton County Court, last Tuesday, the Crediton District Council brought an action to recover £2 3s. 6d. from Mr. F. Edwards for water supplied. Mr. Beal, who appeared for the Council, stated that water was supplied to the defendant for other than domestic purposes. In 1892, he was charged 30s. He complained; and though the Council might, under their regulations, have charged him 40s., they accepted £1 a year. This went on until last year, when defendant paid 15s., and said that this was all that was due. As he refused to pay the balance, the water was cut off. His Honour remarked that this was illegal. Mr. Baker, for the defendant, said that there was no agreement between the Council and Mr. Edwards. His Honour said that, under the Public Health Act, the Council could charge on the rateable value of the premises or by agreement. They had not chosen to adopt the former method; and they omitted to make an agreement. There must consequently be judgment for defendant; but the Council could have leave to appeal. Mr. Beal said he was not surprised at the decision; but he was not responsible for the form of proceedings.

Calverley and Horsforth Gas Company.—The half-yearly report of this Company states that the net profit for the six months, after deducting interest on loans, is £1134, which, with £300 taken from the profit and loss account, makes the amount required for paying the statutory dividends upon all the stocks. The Directors regret that the price of coke and ammoniacal liquor has undergone serious reduction, which will adversely affect the earnings in the current half year.

The Leeds Corporation and the Gas Workers' Union.—According to an arrangement made at the meeting of the Gas Committee of the Leeds Corporation last Wednesday, a conference is to be held to-day between the representatives of the Gas Workers' Union and the Corporation, respecting the claims that have been made for an advance of wages by the workmen employed at the various gas-works in the city, as set forth in the "JOURNAL" last week. Another matter which came up for the consideration of the Committee was an application from the foremen and deputy-foremen stokers—eleven in number—asking that their hours should be reduced from twelve to eight. Subject to the applicants consenting to a small reduction in their wages, the Committee intimated their willingness to grant the request.

Chester United Gas Company.—The half-yearly general meeting of this Company is to be held next Thursday, when the Directors will report a steady increase in the use of apparatus for both cooking and heating purposes, and consequently a greater demand for gas. A large number of incandescent lamps have been introduced for lighting business premises and private residences; and their use has given very general satisfaction. About 100 automatic prepayment meters were fitted up in the past half year. The accounts accompanying the report show receipts to the total of £15,861; the expenditure amounting to £11,276—leaving £4585 to go to the net revenue account. The balance to the credit of this account is £3938; and the Directors recommend the declaration of the full statutory dividends. After the payment of these, there will remain a balance of £575.

The Reinstatement of Public Roads.—The Woolwich Local Board last Friday discussed the subject of the powers of gas and water companies in respect of the opening of public roads. Mr. Fenn moved that letters be written to the South Metropolitan Gas Company and the Kent Water Company, suggesting that they should at once reinstate the roads opened by them in connection with their business. In doing so, he complained that the roads which had been disturbed were not properly repaired; and this had inconvenienced pedestrians and caused the Board to expend the ratepayers' money in making good the defects. Mr. Barnes reminded the Board that, if the Companies did not reinstate the roads to the satisfaction of the Surveyor, the work could be done by the Board, and the expense charged against the Companies. Mr. Richardson said the Companies had a legal right to disturb the roads; and it was the duty of the Board's officials to see that the rules as to reinstatement were carried out. The Surveyor said he would be glad if it could be arranged for the Board to make good the roads, and charge the cost to the Companies. It required a roller to solidify and properly level the surface, and the Companies did not possess a roller. One drawback against the Board doing the work was that they would become responsible for any damage to vehicles in consequence of the re-opening of the ground. The Solicitor (Mr. E. Hughes, M P.) said the Plumstead Board of Works reinstated the road and received £1300 a year from the Gas Company for doing so; but they could not compel the Companies to cease repairing the road themselves, and hand over the work to the Board. Mr. Richardson moved, as an amendment, that the Chairman and Surveyor should have an interview with the representatives of the Companies, with the object of arriving at an amicable arrangement. This was agreed to; it being stated that there was reason to believe the Companies were willing that the Board should do the work on terms.

MISCELLANEOUS NEWS.

THE GASLIGHT AND COKE COMPANY.

The Half-Yearly Report and Accounts.

The following report, with the accounts showing the working of the Company during the six months ending Dec. 31 last (given on p. 235), will be submitted to the proprietors at the half-yearly general meeting next Friday:—

The accounts for the past half year show that, after providing for all fixed charges, there remains a balance of £524,091 4s. 8d., out of which the Directors recommend a dividend at the statutory rate of 12¾ per cent. per annum; carrying forward to the credit of the current half year the sum of £164,121 2s. 5d.

The sale of gas has again been very satisfactory. The consumption by the ordinary customers has increased at the rate of 2·58 per cent., and that by the automatic meter customers has been equal to a further increase of 2·28 per cent.; making together an increase of 4·86 per cent. on the quantity sold during the December half year, 1894.

In order to provide for the expenditure in connection with this latest development of the Company's business (the supply of gas by automatic meters), and for other capital purposes, the Directors, in December last, offered for sale, by tender, a further sum of £100,000 ordinary "A" stock. The whole of this has now been subscribed for at or above the reserve price of £292 per cent.

The prices realized during the half year by the sale of coke and tar products may be considered, on the whole, favourable; and it is satisfactory to be able to report that the Board of Trade returns show that the cement manufacturers, who are considerable buyers of the Company's coke, are participating very largely in the marked improvement which has taken place in the general export trade of the country. On the other hand, the market for sulphate of ammonia continues in a depressed condition, as is evidenced by the reduction in the Company's revenue under this head as compared with the corresponding figures for the December half year, 1894.

The quinquennial re-valuation of the Company's undertaking is now almost complete. In the few cases where the Assessment Committees appear to have been unwilling to be guided by the judgment which Sir Peter Edlin delivered in 1892, the Directors have given notice of appeal to Quarter Sessions.

The Directors much regret to have to report the death of Mr. Francis Farnan, one of the Auditors of the Company. The vacancy thus created will be filled up at the forthcoming meeting; and Mr. Allen Stoneham, a duly qualified proprietor, has given notice of his intention to offer himself as a candidate for the office.

The Engineers of the several departments of the Company have furnished their certificates respectively as to the full efficiency of the whole of the Company's plant.

Following the report is the statement of accounts. As usual, we merely indicate the alterations that have taken place in those portions which are not subject to much variation, giving the rest in full.

Nos. 1 and 2 are the statements of stock, share, and loan capital, the totals of which on Dec. 31 last were as follows: Stock and share capital, £8,754,000; loan capital, £2,444,000. These amounts are the same as on June 30 last.

No. 3 is the capital account, the receipts on which (with premiums, £971,250) stand at £12,169,250. The expenditure is shown in the following items:—

Expenditure to June 30, 1895			£11,648,606 8 10
Expenditure during the half year to Dec. 31, 1895, viz.:—			
Lands acquired, including law charges	£132 14 10		
Buildings and machinery in extension of works	40,764 9 4		
New and additional mains and service-pipes	14,293 11 3		
Do. do. meters	56,435 15 3		
Do. do. stoves	48,959 10 5		
	£160,586 1 1		
Cr. By depreciation of meters	£5,481 0 0		
Do. do. stoves	10,860 0 0		
	16,341 0 0		144,245 1 1
			£11,792,851 9 11
Balance of capital account			376,398 10 1
			£12,169,250 0 0

Nos. 4 and 5 are the revenue and net revenue accounts. These are given in full on p. 235.

No. 6 is a statement showing how the Directors propose to appropriate the balance applicable for dividend. It is as follows:—

Dec., 1894.		
£239,972 ..	Net balance brought from last account	£256,800 19 1
354,078 ..	Net revenue for the half year	267,290 5 7
£594,050		£524,091 4 8
(12 per cent.)	A dividend on the ordinary stock —	
£338,795 ..	12¾ per cent. per annum on £5,646,590	359,970 2 3
£255,255 ..	Balance carried to next account	£164,121 2 5

Nos. 7, 8, and 9 are the reserve and insurance fund and depreciation accounts. The first shows that the balance on June 30 last was £127,344, which was increased to £129,009 on Dec. 31 by the addition of £1665, interest on the sum invested. The insurance fund stood at £85,046 on June 30, and at £86,160 on Dec. 31. The depreciation fund amounted to £43,934 on June 30, and to £44,593 on Dec. 31.

Nos. 10 and 11 are as follows, and Nos. 12 and 13 are given on p. 235.

No. 10.—STATEMENT OF COALS USED, ETC.

Description of Coal.	In Store, 30th June, 1895.	Received during Half Year.	Carbonized during Half Year.	Used during Half Year.	In Store, 31st Dec., 1895.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common . .	134,768	1,093,344	958,987	1,838	267,287
Cannel . .	13,030	14,260	*12,813	—	14,477
Total . .	147,798	1,107,604	*971,800	1,838	281,764

* In addition to this quantity, oil and spirit, the equivalent of 25,342 tons of cannel, have been used during the half year.

No. 11.—STATEMENT OF RESIDUAL PRODUCTS.

Description.	In Store, 30th June 1895.	Made during Half Year.	Used during Half Year.	Sold during Half Year.	In Store, 31st Dec., 1895.
Coke—tons	92,322	606,896	127,782	435,238	136,198
Breeze—tons.	5,263	61,479	29,945	31,019	5,778
Tar—gallons	669,496	10,004,216	9,835,921	17,426	820,365
Ammoniacal liquor—butts	30,227	282,486	281,443	10,067	21,203

SOUTH METROPOLITAN GAS COMPANY.

The Half-Yearly Report and Accounts.

The following is the report of the Directors of the above Company which, with the accounts for the six months ending Dec. 31 last (given on p. 236), will be presented to the proprietors at the half-yearly general meeting on the 12th inst.:—

The accounts herewith presented show the position and working of the Company during the last half year.

The new contracts for coal have been made at an average reduction of 6d. per ton; but this saving has been much more than absorbed by the great reductions in the prices realized for coke and ammonia, foretold in the last report. In the summer of 1894, the price of coke was artificially forced up; and now has come the reaction, with the result that the contracts with the cement makers, who are large consumers, have been made at an average reduction of over 20 per cent., while the yard price has fallen in about the same proportion. The money received for coke does not show so great a loss as these figures indicate—there being an increase in the quantity made; and the deliveries under the high-priced contracts of 1894 extended to the end of December last. As to sulphate of ammonia, the price has continuously fallen from £13 15s. per ton in the summer of 1894 to £8 5s. at the present time. Taking into account the increased quantity of coals, the total receipts for ammonia should have been—had the average price of the corresponding half year been obtained—some £14,000 in excess of the £22,382 which appears in the accounts. Fortunately, the Company have no stock of sulphate, which always tends to depress the market; the system adopted being to sell as it is made.

On the other hand, there has been a satisfactory increase of 7·88 per cent. in the quantity of gas sold, which, with the saving in coal, and certain other economies, due to the increased use of machinery and the willingness of the men to work it, brings up the balance on revenue account to an amount sufficient within £6570 to pay the same dividend as before. In the corresponding half year, there was a considerable surplus profit. This has been given to the consumers in the shape of a reduction in the price of gas amounting in the half year to some £15,000, which would otherwise have increased the balance on the revenue account.

The amount per 1000 cubic feet of gas sold required to pay the dividend is continually decreasing, partly by the raising of new capital at much lower rates, and partly by each £1 of new capital going much farther in gas-producing power than formerly. In the last ten years, there has been a reduction of 3½d. per 1000 feet in this item. In 1885, 1s. 1½d. per 1000 feet sold was required to pay interest on debenture stock and a 12½ per cent. dividend; whereas 10d. only is now required to pay debenture interest and a 13 per cent. dividend.

The increased consumption of gas is, no doubt, largely due to the continued extraordinary development of the demand of weekly tenants, who, with scarcely any exceptions, did not use gas until the introduction of the "penny-in-the-slot," or automatic or coin, meters, as they are called. In the half year, 10,616 of these meters were fixed; making the total to Dec. 31 last 42,949. With them have also been fixed 8731 small gas cooking-stoves; the total of these being 29,548. There has also been a very satisfactory increase in ordinary consumers and cooking-stoves.

This extension of business necessarily requires the constant outlay of capital. "New and additional meters and stoves," alone cost £52,275, besides a considerable outlay on extensions of distributing mains and of manufacturing plant at the older works of the Company. During the year, there has been expended on capital account a total of £136,350; but the business has expanded in a much greater proportion, as is proved by the fact that the capital per ton of coal has been reduced from £4 11s. 9d. in 1894 to £4 5s. 6d. in 1895.

The Directors again express their appreciation of the exertions of their officers and foremen to promote the interest of the Company, and the loyal and cheerful spirit in which the workmen perform their duties. The amount invested in the ordinary stock of the Company by the employees is now £25,624, besides £33,227 of accumulated bonuses and savings on deposit.

The Directors recommend the payment of a nominal 13 per cent. dividend, to be apportioned according to the Scheme of Amalgamation, except £500 due to the "A" stock. They also propose to add to the reserve fund the odd ¾ per cent. of dividend which is payable under the sliding-scale. The deficiency will be drawn from the undivided balance brought forward; leaving £18,661 18s. 7d. to carry forward to the next half year.

Two Directors (Mr. Edward Cardwell and Mr. George Livesey) and one Auditor (Mr. George Maughan Footner) go out of office by rotation. They are all eligible for re-election, and offer themselves accordingly. Mr. Benjamin Leigh Smith has resigned his seat on the Board.

Following the report are the usual statements of accounts. As on previous occasions, we merely note the changes in the portions subject to but slight alteration; giving the remainder in full.

Statements Nos. 1 and 2 show the amount of share and loan capital raised at the close of the past year. The former stood at £2,160,000; the latter, at £800,000. The share capital has been increased by £1315 of "C" stock since the 30th of June last; but the loan capital is unchanged.

Statements Nos. 3, 4, and 5—the capital, revenue, and profit and loss accounts - are given in full on p. 236.

Statements Nos. 6, 7, and 8 show the positions of the reserve, renewal, and insurance funds. The reserve fund stood at £74,464, as compared with £67,715 on June 30 last—the difference consisting of interest on the amount invested, £853; and divisible profits transferred from the net revenue account, £5896. The renewal fund stood at £14,869; and the insurance fund, at £42,464. On June 30, 1895, the last-named fund stood at £42,184. The difference consists of £280 received for interest.

Statements Nos. 9 to 11—furnishing particulars as to the manufacturing operations of the Company—and No. 12, the general balance-sheet, are given in full.

PRESENTATION TO MR. J. W. HELPS.

Some of our readers are doubtless aware that, acting upon medical advice, Mr. J. W. Helps, the Engineer and Manager of the Croydon Gas Company, left England immediately after the last meeting of the Southern District Association, for Egypt, where he intended to sojourn for some weeks with the view of improving his health. He returned to Croydon on Monday morning last week, we are pleased to state, much benefited by the rest and change; and the occasion was taken by the staff and workmen in the engineering department of the Gas Company to testify in a tangible way their respect and appreciation for their chief, by presenting him with a massive plated tray and appointments. The works had quite a festive appearance; being gaily decorated with coloured bunting and mottoes of welcome. The presentation was made in the workmen's club-room by Mr. P. Cantwell, the chief foreman, acting on behalf of the donors, numbering some 219 of the employees. He expressed their pleasure in welcoming Mr. Helps back, they trusted in greatly improved health, and asked his acceptance of their present, which had, he said, been given in a most cordial and spontaneous manner. Mr. Helps, amid hearty cheers, feelingly acknowledged the gift. He said it was difficult, on such occasions as these, to find suitable words to express one's thanks. But he was much gratified to see that, though he was so far away, there were some who had not forgotten him; and he hoped it would be many years before any of the faces before him would be missed. He added that he trusted to be in a position on some future occasion, to give them some particulars of the interesting experiences he had had, and the sights he had witnessed, abroad. The tray bore the following inscription: "Presented to J. W. Helps, Esq., Assoc.M.Inst.C.E., by the workmen and staff of the Engineering Department of the Croydon Gas Company, as a token of respect, esteem, and welcome, on the occasion of his safe return from Egypt. Jan. 26th, 1896."

CHELTENHAM GAS COMPANY.

The New Bill—Issue of Additional Capital—The Proposed Railway.

A Special Meeting of the Cheltenham Gas Company has been held to consider the Bill which has been deposited in Parliament for conferring further powers on the Company, and for other purposes. The CHAIRMAN (Mr. R. J. Ticehurst) presided.

The CHAIRMAN, having explained the object of the meeting, said that all the capital the Company had power to issue had been taken up; and as there had been a steady increase in the consumption of gas, they required further accommodation at the works. In the Bill which they were promoting, power was sought to construct a railway from the Midland station direct into the works. This would effect a considerable saving in the cartage of coal from the railway; for 30,000 tons were used during the year. It would also be a material advantage to the ratepayers of the town, because of the saving it would effect in the wear and tear of the roads. The Directors had taken steps to secure the land that was necessary for the purpose; and if the Bill passed, their way to achieve their object was perfectly clear. They had also taken the opportunity of purchasing further land in close proximity to the works. Another provision of the Bill, which he considered a most important one, was that which empowered the consolidation of the stock. The Directors proposed that all the stock—10 per cent., 7½ per cent., and 7 per cent.—should be consolidated into a uniform 5 per cent. stock, the advantages of which must be apparent to all the shareholders. A third object of the Bill was to raise £100,000 of consolidated 5 per cent. stock. He regretted to say that in recent years the tendency of legislation had been to prevent shareholders in a commercial undertaking such as this from continuing to receive the benefits in the raising of additional capital which hitherto they had enjoyed. The powers they sought for the issue of new capital were dependent upon their submitting it to public competition by auction or tender. The Chairman concluded by proposing a formal resolution approving of the Bill, subject to any amendments made by Parliament, and approved by the Directors.

Mr. JORDAN seconded the motion, which was carried.

A further extraordinary meeting of the Company was then held, for the purpose of sanctioning the raising of £10,000 loan capital, being part of the £20,000 loan capital authorized to be borrowed under the Company's Act of 1872, by the creation and issue of debenture stock of that amount, ranking *pari passu* with the existing debenture stock, and bearing interest at a rate of 4 per cent. per annum.

The CHAIRMAN proposed a resolution sanctioning the raising of the loan, to be offered *pro ratâ* among the shareholders. The necessity of raising this amount, he said, arose from the fact that the Company had an overdraft of £6000 at the Bank, and had to meet the expenses of the new Bill.

Mr. BUBB seconded the resolution, which was carried.

With reference to the proposal to construct a railway connecting the Company's works with the goods yard of the Midland Railway Company, the Engineer (Mr. R. O. Paterson) estimates the cost at £8500. The total length of the line will be 2 furlongs 2·82 chains; and it will be constructed on viaducts and embankments.

THE DUBLIN CORPORATION BILL.

The Gas and Water Provisions.

The Lord Mayor of Dublin, in his solicitude that the Bill which the Corporation are now promoting shall not meet with the same fate as that which befel the one introduced last year, has published a letter explaining its objects. In the first place, his Lordship believes that all the proposals made in last year's Bill which excited opposition have been omitted from the present one, the main objects of which are, he says, to secure that all the Vartry water (the supply of which has cost Dublin so much money) consumed in certain of the townships shall be paid for, and that the quality of the gas supplied by the Alliance Gas Company to the Corporation for the public lighting, and to citizens generally, may be improved, and the price charged therefor fairly adjusted.

With reference to the supply of gas, the letter reads: "The Bill provides for the establishment of testing-places in various parts of the city, and for the use therein of new and improved testing appliances, so as to secure that the illuminating power, purity, and pressure of the gas shall be of the proper standard, and also contains a provision that, in case of disputes arising between the Gas Company and the Corporation on these subjects, the differences shall be determined by the Board of Trade. These provisions are necessary, because the Gas Company contend that, by the instruments which they have in use at their testing-places (and which they say are the proper instruments), the gas is shown to be of, and most frequently above, the proper standard of 16 candles; while, when tested by Corporate officials in the testing-places of the Corporation, upon what the Corporation contend are the proper instruments, the gas is shown to be sometimes as low as 12 candles, and rarely higher than 13 candles. Provision is also made for the adjusting of the price to be charged for the gas; the Corporation contending that, having regard to the fact that gas is supplied in Belfast, at or with discounts of from 2½ to 20 per cent., as low as 2s. 9d. per 1000 cubic feet, the price charged in Dublin—viz. 3s. 7d. per 1000 cubic feet (with discount to large consumers), would be, even if the gas supplied were of 16-candle power, more than should be charged. The Bill affects not only the gas supplied to the Corporation for public lighting, but also the gas supplied to every consumer, so that it is to the interest of the consumers generally within the city to support the Corporation in this matter."

Dealing with the supply of water to the townships, his Lordship states that the contracts with the Commissioners are for a supply of 20 gallons per head per day of the respective populations of the several townships, such supply to be paid for by a rate levied in each township. The townships, however, instead of using 20 gallons per head of the population per day use from 30 to 50, or, in some instances, 60 gallons; and they, availing themselves of some legal technicalities, have refused to pay for any water consumed in excess of the 20 gallons, except in the cases of the Pembroke, Killiney and Ballybrack, Kilmainham, and Drumcondra townships, in each of which, although the conditions are precisely the same as in the non-paying townships, payment is made for all the water consumed. The Bill provides that any water over the 20 gallons consumed in the townships should be paid for at a rate prescribed. It is anticipated that, when the townships have to pay for the excess, misuse of the water will so much diminish that no greatly increased burden will be placed on the townships, while some increase to the water revenue of the Corporation will be made from this source. His Lordship shows, in tabular form, the quantity used in each township for the periods mentioned; and it is apparent from the figures that more care is exercised over the supply in places where the excess is paid for than in those in which no payment is made.

His Lordship believes that these and the other details given by him will commend the Bill to the citizens generally. The statutory meeting of the burgesses will be held to-morrow.

Yesterday week, a meeting was held of the Committee appointed by the Council to deal with the Improvement Bill. A lengthened discussion took place, resulting in a draft report being agreed to, in which the provisions of the Bill were adopted without any substantial amendment. Incidentally the relations between the Council and the Gas Company were dealt with; and some of the members were in favour of a conference being held between the two bodies. It was, however, ultimately considered that any further movement in that direction should be made by the Company.

The Tynemouth Gas-Works Disaster.—We understand that the expenses connected with the interment of the five men who were suffocated at the Tynemouth Gas-Works on the 20th ult., under circumstances reported last week, will be defrayed by the Company, members of the directorate of which and the principal officials attended the funeral. A relief fund for the widows and others dependent upon the deceased has been started.

ACCOUNTS OF THE GASLIGHT AND COKE COMPANY FOR THE HALF YEAR ENDING DEC. 31, 1893.

No. 4.—REVENUE ACCOUNT.

Dr. Cr.

Dec. Half Year, 1894.	To Manufacture of gas—	£ s. d.	£ s. d.	Dec. Half Year, 1894.	By Sale of gas—	£ s. d.	£ s. d.
	Coals, including oil, dues, carriage, unloading and trimming (see Account No. 10)	555,203 8 5		£1,214,359	Common gas, per meter, at 2s. 10d. and 2s. 3d. per 1000 cubic feet	1,250,972 10 10	
£552,236	Salaries of Engineers and other Officers at works	13,014 3 4		75,715	Public lighting and under contracts— Common gas (See Statement No. 12.)	76,700 1 9	1,327,672 13 7
11,911	Wages (carbonizing) £166,259/3/1			£1,290,074			
145,468	Sundries £16,081/6/8	172,340 9 10		£29,175	Rental of meters	..	..
15,624	Purification, including £16,193/12/6 for labour	33,326 11 10		9,528	Rental of stoves	..	10,752 18 8
32,903	Repair and maintenance of works and plant, materials and labour, less received for old materials, £1933 4s. 10d.	148,592 18 9		£250,289	Residual products— Coke, less £42,483 6s. 5d. for labour, &c.	228,437 19 7	
161,900	Distribution of gas—		922,480 12 2	5,485	Breeze, less £1966 4s. 1d. for ditto	3,593 14 11	
	Salaries and wages of Officers (including Rental Clerks)	27,018 0 8		81,189	Tar and tar products	70,831 14 1	
24,940	Repair and maintenance of mains and service-pipes	55,821 7 1		60,027	Ammoniacal liquor and sulphate of ammonia	53,097 14 2	
31,782	Repair and renewals of meters	25,188 19 10		£396,990			355,961 1 9
21,866	Stove fixing, repairs, and renewals	32,643 1 8		£4,094	Rents receivable		4,090 19 9
21,675	Public lamps—		140,671 9 3	210	Transfer fees		222 5 0
17,084	Lighting and repairing	..	17,193 18 7				
	Rents, rates, and taxes—						
3,271	Rents payable	4,423 0 4					
96,960	Rates and taxes	101,760 5 1					
			106,183 5 5				
	Management—						
2,750	Directors' allowance	2,750 0 0					
200	Company's Auditors	200 0 0					
7,692	Salaries of Secretary, Accountant, and Clerks	8,841 1 7					
15,376	Collectors' commission	15,544 6 4					
4,012	Stationery and printing	5,466 8 7					
3,000	General charges	2,454 5 6					
			35,256 2 0				
1,146	Law charges	..	1,239 7 0				
7,674	Bad debts	..	6,484 6 9				
10,782	Annuities	..	12,034 8 2				
	Public Officers—						
886	Gas Referees and Official Auditor	884 11 7					
785	Public testing-stations	869 14 8					
			1,754 6 3				
£1,190,823			1,243,297 15 7				
539,243	Balance carried to net revenue account, No. 5		455,401 15 2				
£1,730,065			1,698,699 10 9	£1,730,066			1,698,693 10 9

No. 5.—NET REVENUE ACCOUNT.

Dr. Cr.

Dec. Half Year, 1894.		£ s. d.	£ s. d.	Dec. Half Year, 1894.		£ s. d.	£ s. d.
	To Interest on debenture stocks and bonds, accrued to Dec. 31, 1895	..	62,659 12 6	£578,767	By Balance from last account	616,771 1 4	
£62,660					Less dividend on the ordinary capital for the half year to June 30, 1895	359,970 2 3	
74,015	Dividend on the preference stocks	74,015 5 0		338,795			256,800 19 1
	Dividend on the maximum stocks	47,500 0 0		£239,972			
47,500			121,515 5 0				
990	Interest on temporary loans and sundry funds		3,336 12 1	539,243	Revenue account (No. 4)	..	455,401 15 2
594,050	Balance applicable to dividend on the ordinary stock		524,091 4 8				
£779,215			712,202 14 3	£779,215			712,202 14 3

No. 12.—STATEMENT OF GAS MADE, SOLD, ETC.

Description of Gas.	Quantity Made.	Quantity Sold.			Quantity used on Works, &c.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lamps.
		Public Lights and under Contracts (estimated).	Private Lights (per Meter).	Total Quantity Sold.				
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
Common	*10,134,319	536,756	8,917,133	9,453,889	136,996	9,590,885	543,434	51,922
Dec. half year, 1894	9,582,506	527,934	8,487,701	9,015,635	127,583	9,143,218	439,288	51,472

* Including 416,687,000 cubic feet of "oil gas."

No. 13.—GENERAL BALANCE-SHEET.

Cr.

Dec. Half Year 1894.		£ s. d.	£ s. d.	Dec. Half Year 1894.		£ s. d.	£ s. d.
£	To Capital—			£			
603,759	Balance at credit thereof	..	376,398 10	187,469	By Cash at Bankers	..	125,817 14 11
	Net Revenue—				Amount invested—		
591,050	Balance at credit thereof	..	524,091 4 8		2½ per Ct. Consolidated Stock £209,093 19 3	..	211,129 17 11
	Reserve Fund—			209,170			
135,699	Balance at credit thereof	129,009 7 7			Stores on hand, viz.—		
	Insurance Fund—				Coals	157,072 7 5	
84,058	Balance at credit thereof	85,180 4 2		180,315	Coke	55,902 1 8	
			214,189 11 9	26,700	Tar and ammoniacal liquor and products	264,012 19 0	
	Depreciation Fund—				Sundry stores	206,272 8 0	
43,285	Balance at credit thereof	..	44,593 0 0	189,924			683,259 16 1
	Interest on debenture stocks and bonds, due on Dec. 31, 1895	..	62,659 12 6	209,943	Accounts due to the Company, viz.—		
62,660	Preference and maximum dividends due on Dec. 31, 1895	..	121,515 5 0		Gas and stove rental—		
121,515	Unclaimed dividends due on Dec. 31, 1895	..	8,003 18 9		Quarter ending Dec. 31, 1895	897,592 4 3	
8,004	Sundry tradesmen and others, for amount due for coals, stores, and sundries	..	319,085 1 11	875,992	Arrears outstanding	12,501 19 3	
298,390	Benevolent Fund	..	1,667 6 8	16,064			910,094 3 6
1,667	Additional capital account	..	66,914 0 4	41,917	Coke and other residual products	31,983 18 8	
..	Temporary loan	..	350,000 0 0	..	Automatic meter supplies (fittings account)	154,087 16 8	
..				5,593	Sundry accounts	2,794 3 11	
							188,815 19 3
1,943,087			2,119,117 11 8	1,943,087			2,119,117 11 8

ACCOUNTS OF THE SOUTH METROPOLITAN GAS COMPANY FOR THE HALF YEAR ENDED DEC. 31, 1895.

No. 3.—CAPITAL ACCOUNT.

Dr. Cr.

	£ s. d.	£ s. d.
To Expenditure to June 30, 1895	..	3,393,738 10 5
Expenditure during half year to Dec. 31, 1895, viz.—		
New buildings and machinery in extension of works	28,727 11 9	
New and additional mains and services	20,983 14 6	
Do. meters	29,917 5 4	
Do. stoves	22,358 2 0	
		101,986 13 7
Total expenditure	..	3,495,715 4 0
Balance	..	88,070 2 0
		3,493,785 6 0

Description of Capital.	Certified to June 30, 1895.	Received since that Date.	Total to Dec. 31, 1895.
	£ s. d.	£ s. d.	£ s. d.
By A stock	500,000 0 0	..	500,000 0 0
B stock	1,350,000 0 0	..	1,350,000 0 0
C stock	308,685 0 0	1,315 0 0	310,000 0 0
Debenture stock, 5 per cent.	800,000 0 0	..	800,000 0 0
	2,958,685 0 0	1,315 0 0	2,960,000 0 0
Premium capital	531,076 8 0	2,708 18 0	533,785 6 0
	3,489,761 8 0	4,023 18 0	
			3,493,785 6 0

No. 4.—REVENUE ACCOUNT.

To Manufacture of gas—			
Coals into store, including cost of petroleum spirit for enriching (See Account No. 9)	£207,861 1 11		
Purification, including £5391 10s. 4d. for labour	11,316 1 3		
Salaries of Engineer and Officers at works	5,851 18 1		
Wages (carbonizing)	48,846 14 7		
Repairs and maintenance of works and plant, including £43,566 2s. 10d. for labour, less £1822 1s. 8d. received for old materials	70,940 12 2		
		£344,816 8 0	
Profit sharing		7,000 0 0	
Distribution of gas—			
Repair, maintenance, and renewal of mains and service-pipes, including £13,842 12s. 8d. for labour	£18,101 18 2		
Salaries, &c., Officers and Rental Clerks	10,093 13 1		
Repair, &c., of meters (£1005 1s. 10d. for labour)	9,289 11 4		
Repair, &c., of stoves (£2796 4s. 11d. for labour)	5,923 0 2		
Gas fittings (labour)	5,334 17 3		
		48,743 0 0	
Public lamps—lighting and repairing, including £5447 6s. 11d. for labour		5,960 10 2	
Rents, rates, and taxes—			
Rents payable	549 7 6		
Rates and Taxes	20,815 12 3		
		21,364 19 9	
Management—			
Directors' allowance	£1,750 0 0		
Salaries of Secretary, Accountant, and Clerks	1,983 0 9		
Collectors	6,819 14 10		
Stationery and printing	1,684 12 0		
General charges	3,356 0 6		
Company's Auditors	75. 0 0		
		15,668 8 1	
Law charges		1,012 8 11	
Bad debts		1,600 17 11	
Pensions and officers and men's superannuation and sick funds		3,541 19 4	
Gas Referees and Official Auditor		218 3 5	
Leasehold renewal fund		500 0 0	
Total expenditure		£450,426 15 7	
Balance carried to net revenue account (No. 5)		153,830 12 9	
		£604,257 14 4	

By Sale of gas—			
Michaelmas, at 2s. 3d. per 1000 feet	£139,202 1 10		
Christmas, at 2s. 3d. per 1000 feet	259,679 2 0		
	£398,881 3 10		
Public lighting and under contracts (see Statement No. 11)	30,941 0 5		
		£429,822 4 3	
Meters in use, 132,786—			
Company's meters at rent: Ordinary, 80,034; automatic, 42,949	£12,486 16 10		
Stoves at rent: Ordinary, 28,469; auto., 29,548	9,692 1 3		
		22,178 18 1	
Residual products—			
Coke, less £15,502 5s. 9d. for labour, &c.	£99,666 3 3		
Breeze, less £2135 19s. 6d. for labour, &c.	3,121 3 4		
Tar, less £329 12s. 4d. for labour, &c.	25,372 1 1		
Ammoniacal liquor, less £176 2s. 5d. for labour, &c.	13,807 13 8		
Sulphate of ammonia, less £689 17s. 11d. for labour; £2562 8s. 9d. for acid, &c.	8,574 14 11		
		150,541 16 3	
Rents receivable		1,659 18 3	
Transfer fees		54 17 6	
Total receipts		£604,257 14 4	

No. 5.—PROFIT AND LOSS (Net Revenue) ACCOUNT.

Interest on temporary loan and deposits		£1,316 15 1	
Interest on debenture stock		20,000 0 0	
Balance applicable to dividend on the ordinary stock		167,161 18 7	
		£188,478 13 8	
Balance from last account			£179,577 17 11
Less—Dividend for half year ended June 30, 1895	£139,207 5 3		
Divisible profits carried to reserve fund	5,896 14 8		
		145,103 19 6	
		£34,473 18 5	
Amount from revenue account (No. 4)		153,830 18 9	
Interest on Bankers' balances		173 16 6	
		£188,478 13 8	

No. 9.—STATEMENT OF COALS.

Description of Coal.	In Store, June 30, 1895.	Received during the Half Year.	Carbonized during the Half Year.	Used during the Half Year.	In Store, Dec. 31, 1895.
	Tons.	Tons.	Tons.	Tons.	Tons.
Newcastle coal	17,790	449,715	408,361	415	58,729
Cannel coal	1,370	571	370*	..	1,571
	19,160	450,286	408,731	415	60,300

* 188,165 gallons of petroleum spirit used as a substitute for cannel.

No. 10.—STATEMENT OF RESIDUAL PRODUCTS.

—	In Store, June 30, 1895.	Made during Half Year.	Used in the Half Year.	Sold in the Half Year.	In Store, Dec. 31, 1895.
Coke—cwt.†	711,475	5,035,621	1,108,521	4,121,561	517,014
Breeze—yards	5,790	81,892	15,702	54,938	17,042
Tar—gallons	269,722	4,008,015	18,558	3,760,443	498,736
Ammoniacal liquor—butts	9,749	125,960	34,865	83,161	17,683

† 1 cwt. of coke about equals 1 sack of 4 bushels, under Weights and Measures Act, 1878

No. 11.—STATEMENT OF GAS MADE, SOLD, Etc.

Description of Gas.	Quantity made.	Quantity Sold.			Quantity used on Works, &c.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lamps.
		Public Lights (estimated).	Private Lights (per Meter).	Total Quantity Sold.				
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
Common	4,134,296	220,220	3,578,960	3,799,180	57,868	3,857,048	277,248	19,707

No. 12.—BALANCE-SHEET.

To Capital—			
Balance—per account No. 3		£88,070 2 0	
Reserve fund—per account No. 6		74,464 10 8	
Renewal fund—per account No. 7		14,869 9 3	
Insurance fund—per account No. 8		42,464 3 2	
Net revenue account—for balance, per account No. 5		167,161 18 7	
Debenture interest, for amount due to Dec. 31, 1895		19,333 6 9	
Sundry tradesmen, for amount due for coals, stores, and sundries		54,102 16 0	
Deposits by consumers		26,986 10 1	
Dividend account (outstanding)		1,361 10 5	
Debenture account „		76 9 9	
Workmen's bonus and savings deposited with the Company		33,227 13 1	
Officers' superannuation and guarantee funds		23,887 8 5	
Temporary loan		95,000 0 0	
		£641,005 18 1	

By Cash at Bankers			£18,798 1 0
Amount invested (reserve fund, £64,020 16s. 8d.; renewal fund £14,012 10s. 3d.; insurance fund, £41,969 13s. 2d.)			120,003 0 1
Cash in hand for sundry payments			500 0 0
Stores in hand—			
Coals and enriching materials	£31,546 13 4		
Coke and breeze	11,623 4 6		
Tar, sulphate, and ammoniacal liquor	7,421 8 9		
Sundry stores	110,037 4 9		
		160,625 11 4	
Investment of workmen's bonus, &c.		10,514 15 0	
Accounts due to the Company—			
Gas meter and stove rental, quarter ending Christmas, 1895	£261,752 18 5		
Arrears outstanding	1,445 19 11	263,198 18 4	
Coke and other residual products		32,909 1 0	
Balance due for automatic gas-fittings		30,881 2 4	
Sundries		3,575 9 0	
		£641,005 18 1	

EXPLOSION AT THE HYDE GAS-WORKS.

The Governor-House Damaged.

On Monday afternoon last week, an explosion, resulting in injury to two persons, occurred at the Hyde Gas-Works. Its cause lay in the governor-house—a building standing within 7 feet of one of the holders, and containing three governors (20, 12, and 10 inches respectively); and its force was so great as to blow off the roof, and seriously damage the walls. The house was about 15 feet square, and of moderate height. The walls were of brick; the inner layer being of fire-brick. A portion of the roof fell inside the building; but curiously—and fortunately—it did little or no damage to the governors. The volume of flame following the explosion reached the adjacent holder, which had recently received a preservative coating of tar. This caught light, and added a new element of danger. The Manager (Mr. W. Smith) was in his office at the time of the occurrence; and, of course, he was quickly upon the spot to give necessary directions. Very promptly the gas from the threatened holder was sent into the mains, and the vessel dropped into its tank. It contained about 40,000 cubic feet of gas, half of which was unfortunately lost. The noise of the explosion caused some consternation; and the attention of a fireman at the fire station of the Corporation was attracted by it. But, on inquiring at the gas-works, he was informed that it was not necessary to bring down the engines. It was just about dinner-time; and many of the men were in the dining-room on the works; and it is somewhat singular that the only casualties attending the explosion occurred to two people who were unconnected with the place. An elderly lady and her granddaughter were taking a dinner to one of the stokers, and they had only passed the governor-house by a few yards when the accident happened. Both were badly burnt; and the old lady had a flesh wound on one foot. Their injuries were promptly attended to; and they were removed to their homes. The curious thing about the explosion is that the governors escaped. They continued to act properly surrounded by the wreckage; so that no inconvenience was experienced in the town from failure of gas. Most sensational accounts of the occurrence found their way into the local papers; but when it is stated that the damage is estimated at £150, it will be readily judged that it was not very extensive.

ELECTRICITY v. GAS AT PRESTON.

At the Meeting of the Preston Town Council last Thursday, there was a further discussion with regard to the relative values of electricity and gas for lighting purposes. The Streets and Buildings Committee had recommended that 30 arc lamps, of 500-candle power each, should be placed in ten of the leading thoroughfares in the town, and that the lamps should be lighted by the National Electric Supply Company, Limited, together with the arc lamps at present in Fishergate—making a total of 42 lamps. Mr. Pearson, who moved the adoption of the Committee's proceedings, said the Company had agreed to light the lamps for 3535 hours per annum at £14 10s. per lamp. The Town Clerk explained that they had offered to enter into an agreement for a fixed term of seven years, which they would be willing to extend to fourteen years. This could be terminated, he said, at any time during the last seven years by the Corporation giving three months' notice. Mr. Pearson supplemented the Town Clerk's observations in regard to the agreement, and said the cost of the whole of the lamps would be £609 per annum. If gas-lamps were erected, they would cost £450 18s. 4d., or £158 less, assuming the maximum candle power of each lamp to be 36, and that, as at present, the lamps were turned out during the time of full moon. Mr. Hamilton asked the Town Clerk at this stage what would be the position of members of the Council who were interested in the Gas or the Electric Supply Company in regard to the discussion. The Town Clerk said they could not vote upon, or take part in it. Alderman Edelston suggested that the consideration of the matter should be deferred, and said the Corporation were now asked to pay one-third more to the Electric Supply Company than had been paid in the past. Considering the long connection between the Corporation and the Gas Company, it would, in his opinion, only be fair to allow one of the Company's representatives an opportunity of saying what he might with regard to gas. He thought they would find that the Gas Company could do a great deal of what the Electric Supply Company could, and at a less cost. Alderman Walmsley severely criticized the general conduct of the Gas Company, and said that, in his opinion, every consumer in Preston—and he was one of them—paid far too much for his gas. After some further discussion, the Committee's minutes were confirmed by 18 votes to 11.

LEICESTER GAS AND ELECTRICITY SUPPLIES.

A Gratifying Growth of Business.

At a Meeting of the Leicester Town Council last Tuesday, the Gas and Electric Lighting Committee reported that, with a view to the members of the Council being more conversant with the working of the departments, they had decided to submit interim reports in the months of January and July, in addition to the half-yearly reports in March and September. With reference to the six months ending Dec. 31 last, 63,548 tons of coal were carbonized. The quantity of gas made was 652,615,000 cubic feet, as against 602,238,000 cubic feet in the corresponding period of the previous year; being an increase of 50,377,000 cubic feet, or 8·36 per cent. The average illuminating power for the same period had been as follows: Belgrave Gate works, 16·91 sperm candles; Aylestone Road works, 16·86 sperm candles. Numerous applications for extensions of mains had been made and granted. After careful consideration, it had been decided to extend the mains to the village of Groby, and also to Bradgate House. The estimated annual consumption of gas was 1,200,000 cubic feet; and the estimated cost of the work, £1250. The Committee also stated that they had recently extended the mains to Anstey, Glenfield, and Humberstone. In connection with the electric lighting department, the Committee mentioned that the total output of electric current from the central station for the half year was 66,916 Board of Trade units; and the number of consumers, 157. Alderman Lennard, in moving the adoption of the report, said the increase in the output of gas during the six months was 8·56 per cent.—the largest increase they had had in any half year since they had possessed the undertaking. This, coupled with the fact that the electric light was being supplied, and the output from it was sufficient to bring them an income of nearly £1700, was specially gratifying. The output of gas had been doubled in the last ten years. The Committee had taken every pains to make people acquainted with the advantages of using gas for cooking and motive power. Their efforts had been successful, for they had now over 500 gas-engines and 700 cooking-stoves using gas in Leicester. They had also over 600 penny-in-the-slot meters fixed; and to the extent of about 80 per cent. of them, they brought entirely new customers. Mr. Billings seconded the motion, which was at once adopted.

THE TEIGNMOUTH GAS UNDERTAKING.

In accordance with the promise (see *ante*, p. 32) that "something definite" should be brought forward with reference to the deficiency on the gas account, the Gas Committee of the Teignmouth District Council made certain recommendations to that body at a meeting last Tuesday. They proposed there should be an inquiry to ascertain whether the receipts for residuals could not be increased; that the charge for gas supplied for public lighting should be increased; that the Gas Manager should report upon the quantity of coal carbonized during the year, the coke and sulphate made, and the amount received for their sale, as well as upon the quantity of gas consumed by the public lamps, and the number of burners; and that the Committee should inquire into the expediency of putting the meters under the control of the Gas Manager instead of the Surveyor. Mr. G. H. Jarvis again returned to the subject of the deficiency of £1700, and said that at the last meeting he recommended that, in order to get out of the difficulty, the price of gas should be raised; but the Chairman (Mr. T. W Hutchings) considered this an unwise course. There were, however, other remedies. If they could not increase the price of gas, they might reduce it so as to get a larger number of consumers. They might place the control of the works entirely in the hands of the Manager, or they could call in an expert to report upon the undertaking. The Chairman said the report of the Gas Committee was an answer to all the points raised by Mr. Jarvis. The report was adopted.

THE FATALITY AT THE HAMPSTEAD ELECTRIC LIGHTING STATION.

The inquest on the man Clarkson, whose death at the Electric Lighting Station of the Hampstead Vestry was mentioned in our "Electric Lighting Notes" last week, was held by Dr. G. Danford Thomas at the Hampstead Dispensary Hall, West End. It was attended by Mr. H. J. Cameron, one of the Inspectors of Factories, as representing the Home Office; while the Vestry Clerk (Mr. A. P. Johnson) was present on behalf of the Vestry.

Ernest Clarkson, brother of the deceased, deposed that he was an experienced workman, having been for some years in his present situation. He thoroughly understood the dangers attending his duties. Witness knew that, for certain work, it was necessary to use india-rubber gloves, and that the firm supplied such gloves to their workmen.

Mr. *F. Schiller*, the Assistant-Engineer, stated that, on being called, he found deceased lying on the floor of the station quite dead; and he immediately noticed that one of the connections had recently been severed. Deceased should not have done this work without calling witness to supervise the operation. He had told him this on a previous occasion. The india-rubber gloves referred to would not be used in this work—indeed, it was difficult to work at all in them; but he could not understand how the shock was received.

Mr. *G. H. Cottam*, the Chief Electrical Engineer of the Vestry, deposed that the current had been switched off the wire that had to be disconnected; but another wire a few inches away was fully charged. He believed the deceased had been worried during the day by the loss of some money; and this may have made him less careful than usual. A small leakage in the installation was found out after the accident. Messrs. Siemens' men were engaged in testing some new plant before handing it over to the Vestry. Witness thought that perhaps deceased had, during his work, handled an adjacent wire, and with his other elbow had touched the adjoining terminal, for that arm had been burnt. He, too, admitted that wearing india-rubber gloves made the work more difficult; while the minutest puncture in the rubber would render them permeable to the current.

Dr. *Cunningham* said he found the man quite dead, with burns on one hand and the other arm; and the *post mortem* examination revealed the fact that the electric shock had caused death.

Mr. *J. Hird*, an electrical engineer in the service of Messrs. Siemens, said he had thoroughly investigated the matter, and came to the conclusion that the probability was that deceased must have slipped down, and, to save himself from falling, grasped at anything and caught the current. The man was experienced, but was found in his shirt-sleeves. This was against the rules of the firm. The wearing of gloves, too, was ordered; but this regulation was not strictly enforced, as they made the work so difficult. The switchboard was an excellent one; but it might be better protected.

One of the jurymen expressed the opinion that the regulation as to the wearing of gloves should be rigidly enforced.

The Coroner, however, pointed out that, though the gloves were provided, and the men understood the danger they ran, they would not wear them.

A verdict of "Accidental death" was returned.

METROPOLIS WATER SUPPLY.

The London County Council and the Water Question.

At the Meeting of the London County Council last Tuesday—Sir ARTHUR ARNOLD in the chair—the subject of the water supply of the Metropolis was again under consideration. At the previous meeting, it may be remembered, a recommendation was brought forward by the Water Committee to the effect that they and the Parliamentary Committee, acting in conjunction, should be authorized to place before Parliament the views of the Council in favour of purer sources of supply. The matter, however, stood over till the next sitting, so that it might be discussed in connection with a further report. Before it came on, the Council had to consider their position in regard to the Bills of the Water Companies which will shortly be before Parliament. This matter was introduced by the Joint Committee (of which Mr. T. M'Kinnon Wood has been elected the Chairman) in a report, in the course of which they stated as follows: "The Staines Reservoirs Bill, the New River Company's Bill, and the Southwark and Vauxhall Company's Bill seek powers for the Companies to obtain the supplementary supply of water required for London by drawing on the River Thames and its tributaries, and by pumping water from Hertfordshire and Middlesex. They propose that the concession should be granted to the New River, Grand Junction, West Middlesex, and Southwark and Vauxhall Companies. The reports of Committees of Parliament and the resolutions of the Council alike indicate that powers of water supply for London should not remain in the hands of commercial companies. We have considered these Bills in connection with the Bills of the Lambeth and Chelsea Companies which stand suspended from last session, and find that, together with those Bills, they involve an addition to the nominal capital of these Companies of £4,300,000. In considering the question of the source of water supply, we are reminded that a further addition to capital of £1,190,000 in respect of the Thames Valley supply is authorized under the Southwark and Vauxhall and West Middlesex Companies' Acts of 1894, and that the New River Company's Bill of the present session is so drawn as apparently to authorize the issue of their capital without limit of dividend. The total expenditure which would thus be authorized would appear to be at least £5,490,000, which might be very largely exceeded under the New River Company's Bill if passed in its present form. The Bills are so framed as apparently to provide for arrangements between the Companies named and others, so that they must be regarded as a definite attempt to obtain for the Water Companies such new statutory powers as may enable them for many years to escape coming under the purview of Parliament and the Local Authorities; and we are advised that the result of the Companies obtaining the powers now sought would be a large addition to the cost of purchase. We are not yet prepared to advise the Council as to the course to be adopted in regard to all the provisions of these Bills; and we propose immediately to give the matter our most careful attention. But, having considered the general effect of the Bills, taken in conjunction with each other, we are strongly of opinion that they must be opposed by the Council; and we accordingly recommend them to adopt the following resolution: 'That the Council, while divided in opinion as to what authority should be entrusted with the administration of the water supply—a matter which can only be finally decided by Parliament, and need not therefore be settled at the present moment—is of opinion that the water supply should be under public control, and not in the hands of private Companies, and resolves to petition against the Bills at present being promoted in Parliament by the Metropolitan Water Companies, and to oppose these Bills in so far as they are prejudicial to the interests of the ratepayers and water consumers, having special regard to the policy of the Council.'"

Mr. T. M'KINNON WOOD moved the adoption of the recommendation.

Lord ONSLOW said it would be well, with regard to the recommendation, to explain the attitude of the Parliamentary Committee, upon which, as they knew, the Moderates were in a large majority. He referred to the past action of the Committee. All the members were now agreed that the powers of the Water Companies should be transferred to a public authority; but there was a difference which extended to what should be the authority entrusted with the management of the water undertakings and the price to be paid for them. The Companies, in order to protect the interests of their shareholders, had introduced certain Bills, which would involve a considerable addition to the sum to be paid by the ratepayers, and would also confer upon the Companies further powers. The Council would learn with pleasure that the resolution was agreed to by an overwhelming majority, composed of members of both parties. All admitted that it must be Parliament, and Parliament alone, which could decide what the authority should be. For the present, points of difference would be kept in the background, and points of agreement put in the foreground, in their opposition to those Bills. All their differences were, he believed, honestly and sincerely due to their care for the interests of the ratepayers. Both parties desired to place only the lightest burdens upon the ratepayers; and when there was a danger that these burdens might be increased, then there was a desire to unite to protect the constituents who sent them to that hall. It was certain that they would not obtain the undertakings of the Companies without very full terms, on the assumption that their plant, reservoirs, and so forth, were adequate to the demands upon them. But these Bills were as an intimation proceeding from the Companies themselves that these conditions did not exist, and that the time had arrived when the Companies must themselves incur expenditure in order to keep up to the standard required. In opposing the Bills, however, the Council would take up a very strong position. It must not be forgotten that deficiencies in the water supply had been marked in the East-end; and, in opposing the Companies' Bills, they would be careful not to oppose them in so far as they were designed to meet the requirements of the next few years, when negotiations would be in progress for taking over the works.

Mr. J. STUART, M.P., strongly supported the recommendation as being an expression of the sincere desire of both parties to avoid a serious danger to the ratepayers of London.

Mr. C. A. WHITMORE, M.P., declined to pledge himself to vote against the second reading of any of the Bills referred to. He asserted that the unanimity spoken of by Lord Onslow was only on the surface, and that, when they came to deal with legislation on the matter, all the old fundamental differences would again arise. He wished to preserve for himself absolute liberty of action of judging any proposal that might be made for the purchase of the water undertakings and the constitution of a public authority on its own particular merits.

Mr. M'KINNON WOOD said it was only by the display of a business-like and conciliatory spirit between the two parties on the Council that it would be possible to obtain the results desired by the majority of the Council and of the people of London.

Sir JOHN LUBBOCK, M.P., said he entirely concurred with the views expressed by Mr. Whitmore. He had thought the resolution, without some qualification, would land them in difficulties. But Lord Onslow's statement had removed his objections, because it was clear they could now let the Bills go to a second reading, and watch them in Committee, especially as regarded the financial arrangements, to see that the ratepayers did not suffer by them.

The recommendation was then agreed to without a division.

The Council then proceeded to consider the adjourned report of the Water Committee with reference to the inspection of water areas in Wales, with a view to a supplementary supply of water for London. The chief features of this report were published in the "JOURNAL" last week.

Mr. IDRIS, in moving the adoption of the report, referred to an amendment standing in the name of Lord Onslow, asking that the complete scheme might be submitted to the Council, showing how it could be carried out by instalments, together with a report on the steps which would have to be taken to provide that the water areas in question should remain available for the supply of the Metropolis.

Lord ONSLOW said he would not press his amendment if the information he desired would be forthcoming.

Mr. IDRIS agreed that the report under consideration should be withdrawn, and a further report brought up at a future date embodying the particulars required.

On this understanding, the amendment was withdrawn; as was also another standing in the name of Colonel Ford. The consideration of the Welsh water scheme is accordingly postponed until a further report is submitted.

EXTENSIONS AT THE WARWICK WATER-WORKS.

A Local Government Board Inquiry has been held by Colonel C. H. Luard at Warwick relative to an application by the Corporation for power to borrow £1750 for the purpose of extending the adits at their water-works. The circumstances which necessitate this expenditure were explained by the Town Clerk (Mr. B. Campbell). Up to 1875, Warwick, he said, depended for its water supply upon the river. In that year, however, it was considered necessary to improve the supply (which was inadequate and unwholesome); and after considering various schemes, it was decided to remove the source from the river to Haseley, some 3½ miles out of the town. Here they had a natural reservoir under the land, extending some 15 or 20 miles in the direction of Birmingham. This was the glacial drift. The original plan was to construct two reservoirs at Haseley, and to drive adits to obtain and collect the water, and then to take it to Warwick by gravitation. At the Local Government Board inquiry at that time, the Inspector (Mr. Harrison) pointed out that, if they obtained the water by driving the adits, it would be unnecessary to construct the reservoirs, because of the natural storage of which they would be able to take advantage. Ultimately the proposal to have a reservoir was abandoned; and this reduced the cost of the scheme by several thousand pounds. They had continued on the same plan; and now had no reservoir at all. They had hitherto obtained what water they required from the adits already in existence. When the mains were being laid to convey the water to Warwick, a large field of running sand was suddenly come upon; and to save very heavy expense, they had, on the advice of the engineer of the scheme, constructed a syphon over the sand-bed. The disadvantage of this was, however, that the syphon at times got charged with air; and then the supply, without previous warning, stopped entirely, and was not renewed until the air in the syphon was exhausted. In 1888 they expended £1500 on making the pumping more effective; and in 1889 they lengthened the adits by 100 yards—the result being a considerable increase of water. They had had a long drought; and it was now found necessary to further extend the adits. It was pointed out, in the course of the evidence, that the adits at present supplied an average of 240,000 gallons per day; and that there were about 12,000 inhabitants, consuming, on an average, 20 gallons per head per day. Some figures were given showing that the consumption was subject to considerable variation, which led the Inspector to inquire whether this did not suggest the desirability of storage. The Town Clerk replied that the question had been gone into; but the expense of providing reservoirs on the land was so enormous that they had not been able to carry the idea into practical effect. It was estimated that £4000 would only provide a small and totally inadequate reservoir. The Borough Surveyor said the system in operation practically gave them all they wanted without storage. They had an enormous natural reservoir extending for many miles; and it was only a question of tapping it sufficiently—the supply of water being governed by the length of adit. To construct a suitable reservoir would cost £10,000. There was no opposition to the application; and at the conclusion of the evidence, Colonel Luard visited Haseley.

Fylde Water-Works Purchase Question.—The Fylde Water Company have refused the offer of £650,000 made by the authorities in the district of supply for their undertaking.

Newcastle and Gateshead Gas Bill.—At a joint meeting of the Watch and Gas and Water Committees of the Newcastle Corporation last Tuesday, it was decided to recommend the Council to oppose the Bill of the Newcastle and Gateshead Gas Company.

THE NEW RIVER COMPANY'S PROPOSED ADDITIONAL WORKS AND THE WATER SUPPLY OF HERTFORDSHIRE.

There is a feeling prevalent among the inhabitants of Hertfordshire that the wells proposed to be constructed by the New River Company, for which, as our readers are aware, they are applying to Parliament for powers, will do injury to the surface in the upper valley of the Lea. With the view of removing this impression, Professor W. Boyd Dawkins, F.R.S., F.G.S., has addressed a letter to the local papers, in which he shows what has been done in the area under consideration, and what it is proposed to do in the future; and then to ascertain, from the experience of other similar areas of chalk from which large quantities of water have been obtained, whether or not the surface has been damaged by the deep wells. He points out that the daily average amount of water pumped during 1891 by the New River and East London Companies from deep wells sunk into the chalk in the area of the Lea to the south of Ware amounted to about 11 million gallons per day. On the question whether this abstraction of water, coupled with the quantity drawn from private wells, affects the surface waters of the district, he quotes the report of the Assistant Commissioner of the Royal Commission on Water Supply (Mr. R. E. Middleton, M.Inst.C.E.), who went, in company with the Engineer to the Hertfordshire County Council, to collect independent evidence. The conclusion arrived at by the former was accepted by the Commissioners; and Professor Boyd Dawkins says: "It is obvious, therefore, that no mischief has been done as yet to the surface waters of the Upper Lea by pumping from the existing deep wells; and that the current idea that the general level of the water in the district has been lowered by pumping is without foundation in fact." The New River Company's Bill makes provision for obtaining a further supply of 12 million gallons from six wells in the sparsely populated area around Hertford and Ware; bringing up the total yield to about 23 millions, leaving a margin of from 17 millions in dry seasons to 33 millions in wet years for further requirements should they arise. Dealing with the effect of heavy pumping from deep wells on the surface in the other districts in which the conditions are the same as in the area of the Lea, Professor Boyd Dawkins states that it may be measured by the effect of pumping on the valleys of the Cray and the Darenth, and the wells of the Croydon area on the surface waters. The area of chalk available for the supply of the Kent Water-Works amounts to about 132 square miles; and the actual quantity pumped from it in 1891 was 13½ millions, without counting the numerous private wells established on the banks of the Thames, some of which yield as much as 1,800,000 gallons a day. The only result has, he says, been to lower the water-level close to the pumps; the general effect on the agriculture of the district being *nil*. The chalk area of the Lea is more than twice as great as this area; and consequently the percolation into it is more than twice as great. In the light of this experience, it is idle, he considers, to suppose that the addition of 12 million gallons to the yield of the existing wells would affect the surface in the Upper Lea, except by lowering the water-line close to the wells during pumping. In the case of Croydon, the experience is practically the same. In that small district, the quantity of water obtained from deep wells has been steadily increasing during the last twenty years without any effect in lowering the general level of the water in the chalk. He thinks there is no reason to believe that the sinking of the proposed wells in the valley of the Lea will cause other effects than those experienced in the two cases above cited; and if local damage of any sort be done, it will, no doubt, be fairly met by the New River Company. There is, in his opinion, water in abundance, both for the local needs and for the deep wells in question, as shown by the report of the Royal Commission, and the evidence upon which it was based.

THE PROPOSED AUXILIARY WATER SUPPLY FOR NOTTINGHAM.

Action by Newark.

The County Council of Nottinghamshire had before them last Thursday an important report by the Health and Sanitary Committee relating to the application by the Nottingham Town Council for a Provisional Order authorizing the extension of their limits of supply. It stated that the Corporation had acquired land at Calverton, where they had bored for water; and they were now also boring at Oxton. Their intention was to sink wells and to erect pumping-stations, with the object of increasing their supply. Having acquired the land by private arrangement, it was not necessary for the Corporation to apply for parliamentary powers to get the water. They had, however, applied to the Local Government Board for a Provisional Order to extend their limits of supply by including in the district the parishes of Calverton, Woodborough, Lambley, Burton Joyce, Oxton, Epperstone, and Radcliffe-on-Trent, and were in negotiation with the Southwell District Rural Council as to supplying Gonalston, Lowdham, and part of Gunthorpe. In order to assist the Committee in deciding upon the course they should take at the Local Government Board inquiry, they had asked the district and parish councils concerned in the scheme what steps they had taken, or intended to take, with regard to the application; and they recommended the Council to give them full authority to take whatever steps they might deem necessary in the best interests of the county. The report having been submitted by Captain Denison, Mr. Marsland said that Newark thought the Corporation of Nottingham were acting in an unfriendly manner towards them; and they wished to make an urgent appeal to the County Council to oppose the application of the Corporation. He thought he was in a position to simplify the matter a little, as the result of what had taken place during the preceding 24 hours. As a member of the Newark Water Committee, he might state that they had made application for a Provisional Order to include within the area of their supply the parishes of Woodborough and Oxton. Newark had expended a very large sum of money in obtaining a supply of water near Farnsfield; and they contended that they were in a better position to supply Oxton, Woodborough, Thurgarton, and Gonalston than the Nottingham Corporation. The Newark Water Committee had taken the best advice on the matter, and had been recommended to take the action they proposed, not so much for the pleasure of supplying these districts, but for the purpose of protecting their pumping-station. He took it that it was a matter which came under the jurisdiction of the County Council, when one authority which had expended £70,000 in obtaining a water supply had to contend against another authority which proposed to dip below them. Mr. Tylden Wright and Mr. Lewis were of opinion that, if Nottingham required more water, they should go to the Derbyshire Hills for it. Alderman T. Bayley, M.P., reminded the members that the Nottingham Corporation supplied in the town and country an area of 70 square miles with water; and he trusted that no obstacle would be put in the way of a good and pure supply of water to the district. Among other speakers was Lord Galway, who pointed out that no parliamentary powers for pumping were required by the Nottingham Corporation, and that they could pump in spite of opposition. The Chairman also remarked upon this point that any individual had an absolute right to put up a pump on his land and raise water, whatever effect it might have on his neighbour. He thought that, in this respect, the law was most unfortunate. The report was adopted.

THE NEW WATER SUPPLY FOR SWANSEA.

An article, extending over some two-and-a-half columns, has appeared in "The Cambrian," describing a visit of a representative to the valley of the Cray, in Breconshire, for the purpose of gathering on the spot some information as to the character of the extensive works which the Corporation have undertaken in the locality for assuring an adequate supply of water for Swansea in the future. The writer gives to Alderman Naysmith the credit for having suggested this valley as the source from whence a new supply should be drawn. The proposal was taken up by the Borough Engineer (Mr. R. H. Wyrill), who, after much investigation, was able to fully bear out the favourable statements made by Alderman Naysmith; and their views were confirmed by eminent engineers, such as Mr. J. Abernethy and Mr. G. H. Hill. A Bill was in consequence promoted in Parliament, to empower the Corporation to spend £270,000 on a scheme; and in June, 1892, the Bill received the Royal Assent. The article records an interesting fact connected with the acquisition of the land for the works. Before the Corporation could secure their spending powers in connection with the scheme, a Mr. M'Turk purchased, for about £12,000, some thousands of acres of land in the neighbourhood, 100 of which he shortly afterwards disposed of to the Corporation for £12,375. Dividing the scheme into four parts—the reservoir, the dam, the tunnel, and the pipe-track—it is stated that on the first two about £150,000 will be spent; on the tunnel, £50,000; and on the pipe-track, £60,000. Having regard, however, to certain further charges, not contemplated when the original estimates were made out, it is expected that the total expenditure will not fall far short of £300,000. This sum, large though it may seem, is said to be below the average of similar undertakings. An examination of the figures relating to the various gravitation schemes for water supply carried out in this country, shows the average cost to be £150,000 for every million gallons of water per day capable of being supplied. As the full supply capacity of the Cray reservoir will be about 6 million gallons per day, it will be seen that the cost falls one-half below that of the average. The dimensions of this huge reservoir will be about a mile long, and one-third of a mile wide; and its holding capacity, approximately 1000 million gallons. The dam will be 1400 feet long; its greatest depth, 100 feet; and the width, about 70 feet. The tunnel will run from the bottom of the reservoir, under Bwlch, coming out in the Swansea valley—a total length of 2¾ miles. It will be 7 feet in diameter, and, except where it penetrates the rock, will be lined with brick. The greatest depth from the surface of the land will be immediately above Bwlch, where the tunnel will be 360 feet under ground. When the water issues at Nantywyth, it will flow in the open for a short distance; and then run into the pipes which will convey it to Swansea. The reservoir will be 1000 feet above the sea-level. The distance from the reservoir to Swansea is about 26 miles; so that, deducting the 2¾ miles of tunnel, there will be piping for over 23 miles. The water may be supplied *en route* to villages like Abercrave, Ystradgunlais, Ystalyfera, Glais, Pontardawe, and Clydach. A covered service reservoir will be necessary; and it is intended to erect this at Town Hill. The pipe-track now being laid will be sufficient for the conveyance of 3 million gallons of water per day—half the available quantity. Later on, a second pipe-track will be laid; and then from Cray alone, Swansea will have a supply double that of the present average consumption. The pipes (which are now being laid by Messrs. John Aird and Sons) are supplied by Messrs. D. Y. Stewart and Co., and the valves by the Glenfield Company. The pipe-track will, Mr. Wyrill thinks, be completed about this time next year. Tenders will next be invited for the construction of the tunnel, and then of the dam and reservoir works. In the carrying out of the scheme, Mr. Wyrill will have the assistance of Mr. Hill.

A Remarkable Offer to the Cardiff Corporation Lighting Committee.—An extraordinary letter, badly written and not punctuated, recently came before the Lighting Committee of the Cardiff Corporation; and its reading caused considerable amusement. The writer, who hailed from the East of England, stated that he had for sale "two inventions for power for electric light engines, to save the heavy cost of coal each year. One engine will be perpetual motion, suitable for the Cardiff electric light works, not patented yet." He went on to say that the saving of coal each year would pay for the purchase of the invention and new engines, &c. Thousands of horse power could, he said, be had without any cost for coal; and after purchase, the power would be obtainable free of cost. The Chairman of the Committee remarked that, as the coal trade was the staple trade of the district, it would not be advisable to get the engine for perpetual motion.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

On the subject of the introduction of carburetted water gas into the Edinburgh works, it is not necessary to write much this week. The Edinburgh and Leith Gas Commissioners have resolved not to go on with the proposed installation until they are fully satisfied that they are acting rightly in the matter, which is, from my point of view, a credit to them; as the more inquiry there is into the subject, the better it will be in the end, not only for the gas consumers, but also for the Commissioners. I mentioned last week that a further report was to be obtained on the subject, and suggested that a chemist might be consulted as to the nature and properties of water gas. It is not probable that they have followed my advice, as they are quite capable of arriving at the same conclusion for themselves—and, indeed, it was about the only conclusion possible; but they have requested Dr. Crum Brown, Professor of Chemistry in the University of Edinburgh, to report to them on the subject. The feeling of the Works Committee is that they must be certain that they are safe before they go forward. There is another matter I may mention, but which I do not wish to enlarge upon, because it is in the hands of one of the leading Commissioners, who will not allow any existing opinions to stand between him and his duty, if reason be given for altering them. This has reference to the reason why the Corporation of Glasgow are not now producing carburetted water gas. Having learned the opinions of, as the expression which was used was, "instructed" members of the Glasgow Corporation, the Edinburgh and Leith Gas Commissioners can scarcely avoid going further and procuring—officially, if it can be got—information as to why carburetted water gas is no longer being supplied in Glasgow.

The installation of incandescent gas lighting which was recently sanctioned by the Corporation of Glasgow, in addition to that already in use, has been completed. It extends the whole length of Eglinton Street, from the Clyde to the toll, and includes about 100 lamps. This, I suppose, is the largest installation of the incandescent light which has been fitted up in this country. It is certainly the largest in Scotland. The thoroughfare is a straight and wide one; and the effect of the light at a long distance can be well seen. It is a pleasure to look at; the street being very clearly lit. As I said some weeks ago, the success of incandescent gas lighting in Glasgow is mainly due to the energy and applicability of Mr. Hamilton, the Inspector of Lighting, who is indefatigable in his studies and experiments in the department of street lighting.

The plebiscite to determine the question of whether the Corporation of Dunfermline are or are not to adopt the Burghs Gas Supply (Scotland) Act, 1876, has been appointed by Provost Walker to be taken next Thursday. In terms of the opinion given by Mr. J. B. Balfour, Q.C., the voting is to be open, instead of by ballot, as all election matters are decided now; but this not being an election, there is no incongruity in that. There is, however, a flavour of antiquarianism about the arrangement that only male occupiers of lands or premises of the yearly value of £4 and upwards, whose names are on the valuation roll, will be allowed to vote. Ownership of property gives no vote; and there is no female franchise. Both these are undoubtedly restrictions on the efficiency of the reference to the electorate. The interest which anyone has in opposing the adoption of the Act is mainly in order to prevent the possibility of a gas contingent guarantee rate being levied. Other than that, the question is little more than an academic one. To the ordinary consumer of gas, it matters little whether the body supplying it is a company or a corporation; but to those who might have to pay a contingent guarantee rate, it means that they must consider the subject well, as in the event of the Corporation failing in their management of the gas supply, the deficiency in the revenue would come out of their pockets—a thing which could not happen if the gas were supplied by a company. I doubt whether there are a dozen people in Dunfermline who are able to apply their minds to the question; but that is not relevant to the matter. The law says the reference shall be made to the community; and the vote of the uninformed is of the same value as is that of the well informed. But the restriction of the franchise means the cutting off of a number of owners resident outside the burgh, and of females resident in the burgh, upon whom the contingent rate would fall. The reference is, therefore, as it is to be made, only a rough and imperfect method of ascertaining the mind of the community; but as such it must be accepted. In the meantime, the electors are being left to themselves in the matter. No attempt is being made by the promoters of the proposed adoption to educate the people in any way; and, on the other hand, the opponents are also silent. It is scarcely necessary to say that the Dunfermline Gas Company are doing nothing towards the solution of the question, as it will only be in the event of the vote on Thursday being in the affirmative that they will come into the field of view. In the expectation that it will be affirmative, Provost Walker has given notice that he will, on the 10th inst., move in the Town Council for a remit to consider as to the opening of negotiations with the Gas Company.

The Directors of the Pitlochry Gaslight Company have had before them a report by Professor George Forbes, on the subject of introducing electric light to the village; and they seem to be captivated by it. The proposal is to erect a turbine wheel of 200-horse power; to lay down mains to outlying places, such as the Athole Hydropathic; and to provide meters for 200 houses. Professor Forbes estimates the cost at £5100; but as the full power would probably not be required for perhaps 10 or 15 years, he considers that £4000 would in the meantime suffice to provide current to supply 3000 lights of 16-candle power, or 6000 lights of 8-candle power. If these were fully used, he estimates a revenue, on the basis of the present charge for gas, of over £2000 a year. Of course, all these lamps would not be required at present; but the scheme would be sufficient for the district for perhaps 40 years. The cost of upkeep would be only about £150 a year; and if a charge were made equal to 2s. 6d. per 1000 cubic feet for gas, there would be a handsome return. The Directors of the Company, after considering the report, resolved to first ascertain how many lights would be taken, and on what terms the water-rights could be acquired. The subject is thus not much further forward.

The Directors of the Moffat Gaslight Company, in their report for the past year, recommend that £40 be written off works account for deterioration; and that dividends of 5 per cent. on the guaranteed and 8 per cent. on the ordinary shares be paid, £60 added to the reserve fund, and £82 5s. 2d. carried forward. The Directors have resolved to reduce the price of gas from 5s. 5d. to 5s. per 1000 cubic feet, or allowing the usual discount to cash payers, 4s. 7d. per 1000 feet.

It is rumoured that the ironworks belonging to the North British Water-Gas Syndicate at Uddingston, have been sold to the Caledonian Railway Company. This, I suppose, is the last of the business at present on this side of the border.

At a meeting of the Arbroath Gas Corporation on Monday night, the Clerk reported that he had been unsuccessful in an appeal to the Parish Council with reference to the poor and school rates chargeable on the gas-works. The Commissioners consider that the works should be treated as a factory, and that there should be a deduction of 20 per cent. on the total sum assessed; but only 10 per cent. had been allowed. It was possible that the question might be tried in a Court of Law but the Corporation agreed to pay the assessment this year as levied. The Manager (Mr. R. S. Carlow) reported that the plant for treating residual products had been completed, and was in good working order. He expected soon to be in a position to sell both boiled tar and naphtha. Mr. Carlow was complimented by Provost Grant and Mr. Harvey on the success of the new departure at the gas-works.

The Aberdeen Corporation Electric Lighting Department have made up their balance-sheet for the past year; and it comes out a success. There were 159,777 units generated; and the leakage amounted to 19,639 units—or a little over 12 per cent. The revenue was £3611, of which £3298 was derived from the sale of current by meter, £156 from public lighting, and £159 from meter-rental. The expenditure on the working of the undertaking was £1356; and on interest, depreciation, &c., £1819—leaving a net profit of £435. It is stated that a sum has been placed to the sinking fund account; but the amount is not given. All that the undertaking has received from the profits on gas is £217. The Committee have resolved to place the free surplus to a reserve account, and to recommend that the price of current be lowered from 6d. to 5d. per unit, and that the meter-rents be reduced by one-half.

A deputation from the Glasgow Corporation visited Edinburgh on Thursday, to see the electric lighting installation there, and to learn, particularly, about the arrangements for street lighting. It appears that in Glasgow the public lighting is unsatisfactory; there having been, within a week, two failures in the streets, on which occasion the gas-lamps required to be lighted. Mr. Mackenzie and other members of the Edinburgh Corporation received the deputation in a very friendly spirit, and showed them all the works, which were acknowledged by the visitors to be most complete. A little dinner was afterwards served, at which Mr. Mackenzie took the chair, and Bailie Kinloch Anderson, the Convener of the Works Committee of the Edinburgh and Leith Gas Commission, was Croupier. Several toasts were drunk; the last one being "Success to the Gas Commission," proposed by the Chairman, as he said, to show that there was nothing but a friendly rivalry between his Committee and the Commissioners. Bailie Kinloch Anderson's name was coupled with the toast; and he suitably acknowledged it. Of the other noticeable incidents, may be mentioned the remark by Mr. Primrose, of Glasgow, that the Edinburgh works were probably as complete as any on the Continent of Europe; and the statement by the Chairman, that they found the street lighting promoted a demand for current, which he attributed to the fact that when they flooded the street with light the shopkeepers in it felt it necessary to have more light inside their premises. This is very clever; and the Town Council might do as much for the gas undertaking, by improving the lighting of those streets where gas has not yet been superseded.

A report has appeared of a fire this morning at the Brechin Gas-Works. It appears that some men were removing the tar from the hydraulic main into a tar-cart, when it became ignited, and burnt all of them more or less seriously. The fire could not be extinguished until the works had sustained someinjury.

Malvern Link Water Bill.—Mr. Baldwin Latham has prepared an estimate of the cost of the new water-works proposed to be constructed under the powers contained in the Bill deposited in Parliament by the Malvern Link District Council; the total, including the purchase of all the necessary lands, and after providing for contingencies, being £35,000.

Electric Lighting and Dust-Destruction Schemes.—The Hackney Vestry have adopted a scheme of electric lighting in combination with a dust destructor. The capital outlay will be £80,000; but it is estimated that the parish will reap a profit. During the discussion of the project, it was stated that Shoreditch, Tottenham, and Walthamstow were about to adopt similar schemes.

Finding Water by "Divination."—Following up his recent success at Richmond, as recorded in the "JOURNAL" last week, Mr. Mullins, the "diviner," has been the means of finding a copious spring of water on the estate of Mr. A. Money Wigram at Havering. Mr. Mullins indicated a spot where he said water would be met with at a depth of, he thought, about 30 feet. A shaft was sunk; but before the depth specified had been reached, water came in so rapidly that operations had to be suspended, owing to the impossibility of working the pumps fast enough to keep the well empty.

Gas and Electric Lighting at St. Austell.—There is considerable rivalry at St. Austell between the Gas Company and the promoters of a new electric light undertaking. For very many years the Company have had the contract for the lighting of the streets; but the electricians are now making a bid for it, and trial lamps have been placed both by them and by the Company in prominent parts of the town. According to a local correspondent, the two Companies are running each other very closely in the matter of price. The Urban District Council have the matter under consideration

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Feb.* 1.

Sulphate of Ammonia.—The attitude of consumers is still rather apathetic, notwithstanding the tempting price reached. But in the earlier part of the week, there was a considerable amount of covering by dealers to be done, and London makers having again put up their quotations, there was a recovery in values of about 2s. 6d. per ton. At the close, however, the tone is quiet; and quotations are £8 7s. 6d. to £8 8s. 9d. per ton f.o.b. at the ports. In the forward position, there would be large buyers at about spot prices; but at any substantial premium, buyers are indifferent.

Nitrate of Soda.—The nitrate of soda combination arrangements do not seem to have progressed during the week; but, in the confidence that they will be carried through, the market remains firm at a slight advance. Spot value is 7s. 9d. to 7s. 10½d. per cwt. according to quality; and due cargoes of ordinary quality are worth about 7s. 9d.

LONDON, *Feb.* 1.

Tar Products.—There is a decided spurt in carbolic acid, and its congeners, and prices are higher. Creosote continues dull; but there is a little better demand for heavy tar oils. Pitch is moderate, and the market somewhat languid. Stocks in makers' hands, however, are extremely limited; and there is no reason why prices should go lower, excepting from over-anxiety on the part of makers to sell. Benzols are distinctly dull, and the price has receded during the past two or three days. There is a good market for anthracene; and the Committee's prices are maintained. Solvent naphtha is in fair request at former rates. Crude 30 per cent. naphtha is now neglected.

The following prices may be taken as representing business done during the week: Tar, 18s. 6d. to 24s. Pitch, nominal, 33s. west coast; 36s. east coast. Benzols, 90's, 2s. 2d.; 50's, 1s. 10½d. Solvent naphtha, 1s. 3d., home market; 1s. 4½d. for shipment. Toluol, 1s. 7d. Crude, 30 per cent., naphtha, 9d. Creosote, 1d. Naphthalene, pressed, 42s. 6d.; drained, 27s. Cresylic acid, 1s. 1d.; crude, 10½d. Carbolic acid, 60's, 1s. 10½d.; 75's, 2s. 2½d. Anthracene, "A," 1s.; "B," 10d.

Sulphate of Ammonia is moving off a little more freely; but buyers are very shy of forward purchases. The uncertainty of the nitrate market is said to be the chief cause of the exceptional low prices of sulphate. Considerable shipments are taking place; and the market has shown but little fluctuation during the week—prices ranging from £8 7s. 6d. to £8 10s., less 3½ per cent. at all ports. Gas liquor is being sold at 6s. to 7s. per ton, 5° Twaddel.

The Administration of the Hull Corporation Water Department.—The Water-Works Committee of the Hull Corporation are at present conducting a private inquiry as to the administration and working of the engineering section of the department. At the conclusion of their investigation, a report as to the result will be issued.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Very striking evidence of the present depressed and unsatisfactory condition of the coal trade is afforded by the fact that the Stockport Corporation have just been enabled to secure contracts for a further twelve months' supply of gas coal, commencing from June next, at even lower prices than last year. The amount, I understand, is 30,000 tons, and the price about 4d. per ton below the basis of their present twelve months' contract, which commenced from last June. A firm of local merchants have secured a portion of this contract; but where they are getting the coal from, I am not able to state. A part at least, however, is being supplied by the Lancashire pits, as the Abram Colliery Company are amongst the contractors. With regard to the general condition of trade, if there is any change at all to notice, it is perhaps in the direction of a weakening in prices. The exceptionally mild season has thrown a large quantity of round coal upon the market, and compelled many of the pits to keep on short time, with the result that there has been a good deal of pressure to get rid of surplus quantities, and "nibbling" here and there in prices to effect sales. This applies not only to the better qualities of round coal; for inferior sorts, for general manufacturing requirements, still hang upon the market, and are extremely low in price. The general pit prices, however, remain without actually quotable change; the averages being about as follows: Best Wigan Arley coals, 10s. to 10s. 6d. per ton; Pemberton four-feet and seconds Arley, 9s. to 9s. 6d.; common house-fire descriptions, 7s. to 7s. 6d.; and steam and forge coals, 6s. Engine fuel moves off pretty freely, many of the collieries having but a limited output of slack to dispose of. Quotations are steady at 3s. to 3s. 6d. per ton at the pit for common sorts; 4s. 6d., for better descriptions; and 5s., for some special qualities. For shipment, a fair demand is reported in some quarters; but no higher prices are ruling. Some of the better qualities of steam coal are fetching 7s. 9d. per ton; but ordinary sorts are still readily obtainable at 7s. to 7s. 6d., delivered at Garston Docks, or the High Level, Liverpool. With regard to the rumours which have been afloat recently, and have been referred to publicly in speeches delivered by the President of the Miners' Federation and the Chairman of the Coalowners' Association, of further large colliery developments, I may mention that the facts are that the Wigan Coal and Iron Company have secured about 30,000 acres of coal in the Midlands; the seams being similar to those now being worked at the Shire Oaks Collieries. The coal purchased by the Company has not yet been opened out; and it may be a couple of years before it is actually worked.

Northern Coal Trade.—There has been no increase in the demand for Northumbrian steam coal during the past week; but with irregular working at the collieries, the supply of small coal is less, and prices for it are rather firmer. Best Northumbrian steam coals are quoted at 7s. 9d. per ton f.o.b.; but the pits are still comparatively bare of work,

GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 219).

Issue.	Share.	When Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	16 Oct.	10½	Alliance & Dublin 10 p. c.	23—24	..	4 7 10
100,000	10	,,	7½	Do. 7 p. c.	16½—17½	..	4 5 8
300,000	100	2 Jan.	5	Australian (Sydney) 5% Deb.	107—109	..	4 11 9
200,000	10	16 Oct.	4	Belgrano (B. Ayres), Limited	7—8	..	5 0 0
100,000	Stck.	30 Dec.	5	Do. 5 p. c. Deb. Stk	92—97	+2	5 3 1
200,000	5	14 Nov.	6½	Bombay, Limited	7—7½	+¼	4 6 8
40,000	5	,,	6½	Do. New, £4 paid	5—5½	..	4 14 7
380,000	Stck.	14 Aug.	12	Brentford Consolidated	273—278	..	4 6 4
210,000	,,	,,	9	Do. New	212—217	..	4 2 11
50,000	,,	,,	5	Do. 5 p. c. Pref.	—	..	—
159,375	,,	16 Dec.	4	Do. 4 p. c. Deb. Stock.	127—132	+4½	3 0 7
220,000	Stck.	27 Sept.	11	Brighton & Hove Original	230—235	..	4 13 8
208,820	,,	,,	8	Do. A Ord. Stk.	185—190	..	4 4 3
933,500	Stck.	29 Aug.	5	Bristol, 5 p.c. max.	124—128	..	3 18 1
420,000	20	27 Sept.	11½	British	54½—55½	..	4 1 1
50,000	10	29 Aug.	11½	Bromley, Ordinary 10 p. c.	22½—23½	..	4 17 10
67,010	10	,,	8½	Do. 7 p. c.	19—20	..	4 5 0
500,000	10	14 Nov.	4	Buenos Ayres (New) Limited	8—8½	+¼	4 14 1
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	101—103	..	5 16 7
150,000	20	11 July	8½	Cagliari, Limited	30—32	..	5 3 3
100,000	10	27 Sept.	6	Cape Town & District, Ltd.	12¾—13¼	+¼	4 10 7
50,000	50	2 Nov.	6	Do. 6 p. c. 1st Mort.	56—58	..	5 3 6
550,000	Stck.	16 Oct.	13½	Commercial Old Stock	325—330	..	4 1 10
165,000	,,	,,	10½	Do. New do.	256—261	+2	4 0 6
165,000	,,	16 Dec.	4½	Do. 4½ p. c. Deb. do.	147—152	..	2 19 2
800,000	Stck.	16 Dec.	13	Continental Union, Limited.	265—270	+2	4 16 3
200,000	,,	,,	10	Do. 7 p. c. Pref.	210—215	..	4 13 0
51,600	Stck.	29 Aug.	14	Croydon Com'cial A 10 p. c.	280—285	..	4 18 3
137,500	,,	,,	11	Do. B 7 p. c.	222—227	..	4 16 11
535,000	Stck.	29 Aug.	5½	Crystal Palace Ord. 5 p.c. Stk	127—132	..	3 19 6
60,000	,,	,,	5	Do. 5 p. c. Pref.	—	..	—
486,090	10	30 Jan.	11	European, Limited	25½—26½*	..	4 3 0
354,060	10	,,	11	Do. £7 10s. paid	17—18*	+¼	4 14 3
5,746,590	Stck.	14 Aug.	12¾	Gaslight & Coke, A, Ordinary	300—305	+1	4 3 7
100,000	,,	,,	4	Do. B, 4 p. c. max.	107—112	..	3 11 5
665,000	,,	,,	10	Do. C, D, & E, 10 p. c. Pf.	292—297	..	3 7 4
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	135—140	..	3 11 5
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	200—205	..	3 13 2
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	198—202	..	3 9 3
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	287—292	..	3 8 6
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	170—174	..	3 9 0
1,061,150	,,	16 Dec.	4	Do. 4 p. c. Deb. Stk.	137—140	..	2 17 2
294,850	,,	,,	4½	Do. 4½ p. c. do.	148—153	..	2 18 9
908,000	,,	,,	6	Do. 6 p. c. do.	200—205	..	2 18 6
70,000	10	30 Oct.	6	Hongkong & China, Limited	13—14	..	4 5 8
3,800,000	Stck.	14 Nov.	12	Imperial Continental	247—252	+5	4 15 3
376,400	100	1 Feb.	4	Do. 4 p. c. Debs. Red.	100—103*	+2	3 17 8
473,600	Stck.	14 Aug.	3½	Do. 3½ p. c. Deb. Stk	100—110	..	3 3 8

Issue.	Share.	When Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
75,000	5	16 Dec.	6	Malta & Mediterranean, Ltd.	6—6½	..	4 12 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	113—116	..	4 6 2
250,000	100	,,	4½	Do. 4½ p. c. Debs.	107—109	..	4 2 7
541,920	20	14 Nov.	5	Monte Video, Limited	16—17	..	5 17 8
150,000	5	28 Nov.	8	Oriental, Limited	8—8½	+¼	4 14 1
135,000	5	,,	8	Do. New, £4 10s. paid	6½—6¾	..	5 6 8
15,000	5	,,	8	Do. do. 1879, £1 paid	1¼—1½	..	4 11 5
60,000	5	12 Sept.	7	Ottoman, Limited	5—5¼	..	6 7 3
166,870	10	14 Feb.	2	Para, Limited	1¼—1½	..	11 8 6
420,000	100	2 Nov.	6	People's Gas } 1st Mtg. Bds.	105—110	..	5 9 1
500,000	100	9 Dec.	6	of Chicago } 2nd Do.	100—105	..	5 14 3
250,000	10	16 Oct.	7	San Paulo, Limited	11—12	..	5 16 8
500,000	Stck.	29 Aug.	15½	South Metropolitan, A Stock	378—383	..	4 0 11
1,350,000	,,	,,	12	Do. B do.	310—315	..	3 16 2
308,685	,,	,,	13	Do. C do.	325—330	..	3 18 9
310,000	,,	16 Jan.	5	Do. 5 p. c. Deb. Stk.	173—176	..	2 16 10
60,000	Stck.	12 Sept.	11½	Tottenham & Edmonton, A	250—255	..	4 10 2
60,900	,,	,,	8½	Do. B	—	..	—
170,380	10	30 Dec.	10	Tuscan, Limited.	13—14	..	7 2 10
149,900	10	2 Jan.	5	Do. 5 p. c. Debs. Red.	100—102	..	4 18 0

WATER COMPANIES.

746,021	Stck.	30 Dec.	10½	Chelsea, Ordinary	292—297	..	3 9 0
150,000	,,	,,	5	Do. 5 p. c. Pref.	168—173	..	2 17 9
160,000	,,	,,	4½	Do. 4½ p. c. Pref. Stk., 1875	—	..	—
175,785	,,	27 Sept.	4½	Do. 4½ p. c. Deb. Stock	155—160	+2	2 16 3
1,719,514	Stck.	16 Oct.	7	East London, Ordinary	220—225	..	3 2 2
654,740	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	155—160	+1	2 16 3
100,000	,,	,,	3	Do. 3 p. c. Deb. Stk.	105—107	+1	2 16 1
700,000	50	16 Dec.	6½	Grand Junction, 10 p.c. max.	118—122	+2½	2 13 3
280,000	Stck.	27 Sept.	4	Do. 4 p. c. Deb. Stk.	145—150	+5	2 13 4
708,000	Stck.	29 Aug.	12	Kent	310—315	..	3 16 2
160,000	,,	,,	7	Do. New, 7 p. c. max.	200—205	..	3 8 3
1,043,800	100	30 Dec.	7½	Lambeth, 10 p. c. max.	245—250	..	2 18 3
406,200	100	,,	7½	Do. 7½ p. c. max.	208—213	..	3 8 1
330,000	Stck.	27 Sept.	4	Do. 4 p. c. Deb. Stk.	145—150	+2	2 13 4
500,000	100	14 Aug.	12⅝	New River, New Shares	387—392	..	3 3 3
1,000,000	Stck.	30 Jan.	4	Do. 4 p. c. Deb. Stk.	141—146*	..	2 14 10
902,300	Stck.	16 Dec.	6	S'thwk & V'xhall, Ordinary	152—157	+2	3 16 5
126,500	100	,,	6	Do. Do. 7½ p. c. Max.	139—142	..	4 4 6
489,200	Stck.	,,	5	Do. Do. 5 p. c. Pref.	168—173	..	2 17 9
1,019,585	,,	—	4	Do. 4 p. c. A Deb. Stk.	145—150	+2	2 13 4
1,155,066	Stck.	16 Dec.	10	West Middlesex	292—297	+2	3 7 4
200,000	,,	,,	4½	Do. 4½ p. c. Deb. Stk.	155—160	..	2 16 3

*Ex div.

and are likely to be so for a few weeks longer. For small steam, the price is now 3s. 6d. to 3s. 7½d. per ton. In other kinds of coal, there is a better demand; but for household sorts, it is still below the average at this time of the year. For shipment, household coals are quoted about 10s. to 11s. per ton f.o.b. In regard to manufacturing coals, the demand is decidedly better; and though the price is the same for prompt supplies, it is rather higher for forward delivery. Coking coal is in more request; but the price is unaltered this week. Gas coal is still firm; and though there is now a reduction in the quantities that are taken under old contracts, there is still a large demand, which must soon be added to by larger exports. For single cargoes, the price quoted is 6s. 6d. to 7s. per ton f.o.b.; and for contracts forward, it is not probable that the quotations will be much below these figures. Indeed, in view of uncertainty as to the working arrangement with miners, there are some coalowners who seem to believe that there will be rather higher prices, because the improved state of the iron and steel industries will cause them to take up more coal in Durham, and thus lessen the competition in the markets. Coke is firm; exports having been a little heavier, and more being now taken both by the Cleveland and Durham furnaces, and by those in the north-west. For shipment, prices of best Durham coke vary from 14s. to 15s. per ton f.o.b.; and some of the contracts that have been taken for local furnaces, seem to point to the probability of somewhat higher prices prevailing. In regard to gas coke, there has been less movement the past few days; but the production is being slowly lessened, and the diminished output is well taken up. There is no alteration in the prices; the bulk of the large contracts being now fixed, while the land-sale consumption diminished with the household coal trade.

Scotch Coal Trade.—Though there are indications of an improvement in the demand for coal, the market does not get any better. There are not a few inquiries for forward delivery, particularly from abroad; but the prices offered are so poor that they are scarcely being looked at. There is keen competition for any business which is being offered. Steam and ell are both being pressed for sale, at unchanged prices. Splint is abundant; and can be bought at the pit for 4s. 6d., and even less, per ton. There is much broken time at the collieries; and stocks, particularly of large coal, are increasing. The prices quoted are: Main, 5s. 10d. per ton f.o.b. Glasgow; ell, 6s. 9d.; splint, 6s. 3d. to 6s. 6d.; and steam, 7s. 6d. The shipments for the week amounted to 125,003 tons—a decrease on the preceding week of 956 tons, but an increase as compared with the corresponding week of last year of 44,250 tons. For the year to date, the total shipments have amounted to 389,473 tons—an increase over the same period of last year of 24,978 tons.

Leakage of the New Reservoir at Redruth.—It was stated in last week's "Journal" that the new reservoir for the supply of Redruth had been completed, and water turned into it. It was subsequently ascertained that a serious leak existed, and that water was being lost at the rate of 80,000 gallons in 24 hours. At a meeting of the District Council yesterday week Dr. A. E. Permewan, the Chairman of the Water Committee, reported that the water was being drawn off in order that the nature of the defect might be ascertained. He thought it would prove to be a fissure in the rock; for, judging by the magnitude of the leakage, he did not think it could be caused by a number of small defects. If it was a local affair, it would not cost much to set right; but, in the meantime, the Committee asked for power to have a cheque for £1662 drawn in favour of the Contractor. The Clerk of Works reported that in his opinion the leakage was not due to faults of workmanship; but he could not pronounce definitely on the subject. The Council assented to the course pursued by the Committee.

The Severn Conservators and the London Water Supply.—At a meeting of the Severn Conservators, at Birmingham, last Thursday—Mr. Willis Bund presiding—the Committee reported that a conference of Fishery Authorities affected by the proposed scheme of supplying London with water from the district of the Wye had been held at Hereford, when it was agreed that each Board should conduct its opposition separately, but that joint action should be taken when the interests of all the Boards were affected. The Severn Conservators could, therefore, take no further steps at present, though the result of the scheme being adopted would be most serious. The combined effects of the Birmingham and London schemes would be to reduce the productive capacity of the Wye almost to zero; and therefore the Severn would have to supply not only its own fishery ground, but also that of the Lower Wye district. The Chairman said he believed the proposed Welsh water scheme for London would have a disastrous effect on the Severn; but, as the estimated cost was £38,000,000, there was no great likelihood of the project being carried out at present.

Sales of Shares.—At the Mart, Tokenhouse Yard, E.C., on Monday last week, Mr. Alfred Richards sold, under a will, shares and stock in well-established Gas Companies. There was a large attendance of investors; and the sale was over in a very few minutes. "B" shares (£10) in the Eastbourne Gas Company fetched £26 5s. each; 5 per cent. perpetual debenture stock in the Harrogate Gas Company, £160 and £161 per cent.; Redhill Gas Company's £5 shares (£3 10s. paid), £9 12s. 6d. each; Romford Gas Company's "B" shares (£5), £8 10s. each; Sunbury Gas Company's £5 shares, £6 apiece; and West Ham Gas Company's original (£5) shares, at prices ranging from £11 12s. 6d. to £11 17s. 6d. per share—some of the Company's £10 shares being sold for £15 17s. 6d. and £16 each.——At the Mart on Wednesday, Messrs. Fox and Bousfield sold parts of freehold shares in the New River Company at the rates of from £86,400 to £88,200 per entire share; and also some new (£100) shares at £405 apiece.——A few original £10 shares in the Pontefract Gas Company have lately been sold at £27 16s., and ordinary £10 shares at £21 7s. 6d.——£5 shares in the Knottingley Gas Company realized, at a sale last week, from £9 7s. 6d. to £9 12s. 6d.——Twenty £1 shares in the East Ardsley Gas Company have changed hands at £1 9s. each.—Shares in the Mirfield Gas Company to the number of 39 were disposed of at Leeds last Tuesday for £12 8s. 9d. each.

NEW "PENNY-IN-THE-SLOT" COOKERS.

Arranged specially for Prepayment Meters.

We have given particular attention to the strength and simplicity of these Cookers, which are constructed upon the principle of our celebrated "Eureka" Cooker, and are practically indestructible. They are very easily cleaned, and are all constructed in as many parts as possible, so that, in case of breakage, the parts may be readily and cheaply replaced.

403 and 404.

No.	External Dimensions.			Oven.			Hot Plate.	No. of Boiling-Burners	Price.	White Enamelled Crown extra.
	High.	Wide.	Deep.	High.	Wide.	Deep.				
401	18½	13½	11½	14	11	9½	13½ by 11½	1	28/6	—
402	24½	15½	15	18	11	11	15½ ,, 15	2	40/-	2/6
403	30	18	17	19	11	11	18 ,, 17	2	45/-	2/6
404	30	18	17	19	13½	11	18 ,, 17	2	50/-	2/6
404	If fitted with Enamelled-Lined and Jacketted Door and Fire-Brick Crown, as adopted by The London Gaslight and Coke Co.								55/-	2/6

Any of these Cookers, except No. 401, can be fitted with Griller at an extra charge of 2/6; but the adoption of the Griller is not recommended for use with Prepayment Meters.

JOHN WRIGHT & CO., LIMITED,

The Oldest and Largest Gas-Stove Manufacturers in the World,

ESSEX WORKS, BIRMINGHAM, and 105, CHEAPSIDE, LONDON.

South Staffordshire Water Company.—The Directors of this Company last Thursday resolved, subject to the examination of the accounts by the Auditors, to recommend the declaration of a dividend for the half year ending Dec. 31 last at the rate of 5½ per cent. per annum, less income-tax, carrying forward a balance to the credit of the present half year amounting to £3194.

Durham Gas Company.—Reporting upon the past year's working, the Directors of this Company state that they have an available balance of £2967 (after deducting the interim dividend of £2480) out of which to pay a dividend for the half year ending Dec. 31 of 5 per cent. on the original capital and 3½ per cent. on the additional capital; making a total of 10 and 7 per cent. for the year, and leaving a balance of £487 to be carried forward to the current year's account. The Directors have reduced the price of gas outside the borough by 3d. per 1000 cubic feet.

Proposed Extension of the Newark Water Supply.—The Newark Corporation yesterday week empowered the Water Committee to make application to the Local Government Board for power to extend the limits of the water supply so as to include the villages of Oxton, Thurgarton, Epperstone, and other surrounding parishes. The Chairman of the Committee (Mr. W. Doubleday) stated that the Newark Corporation could, in his opinion, supply water to these villages at a cheaper rate than the Nottingham Corporation. It was estimated that the additional capital required would not exceed £20,000.

Kendal Corporation Gas Supply.—At a meeting of the Kendal Corporation last Tuesday, the Chairman of the Gas and Water Committee (Mr. Monkhouse) made a gratifying statement as to the position of the gas undertaking, which, it will be remembered, has only been a short time in the hands of the local authority. He said it was the intention of the Committee to make, at an early date, a substantial reduction in the price of gas. When the accounts were made up for the first nine months, after paying interest and redemption, they had in hand £1140. There was a small loss on the water account; but, after redeeming it out of the profits on the gas-works, they had in hand a surplus of £569 to begin the current year with. The increase in the consumption of gas during the last twelve months reached the amazing quantity of little short of 4 million cubic feet; the increase in the income being £597. It was estimated that, by the end of March next, they would have a surplus profit of nearly £1500, in addition to the sum brought forward.

Water Supply in the Berlin Out-Townships.—A Company has been formed in Berlin, with a capital of £250,000, to be known as the Continental Wasserwerks Gesellschaft. The Company will acquire and take over the works which supply Lichtenberg, Friedrichsberg, Rummelsburg, Boxhagen, and Friedrichsfelde, near Berlin, with water; and new works are to be constructed at Steele.

Gas-Engines for Pumping Water at Ashbourne.—Major-General Crozier recently conducted an inquiry on behalf of the Local Government Board into an application made to them by the Ashbourne Urban District Council to borrow £10,000 for works of water supply. The water, which is of excellent quality, is obtained by means of a well sunk in the Bunter sandstone. The scheme provides for pumping the water by gas-engines into a service reservoir of 100,000 gallons capacity, whence it will be distributed throughout the town. There was no opposition. The Engineer of the scheme is Mr. W. H. Radford, Assoc.M.Inst.C.E., of Nottingham.

The London County Council and Projected Electric Lighting Schemes for South London.—The various governing bodies concerned have received a notification to the effect that the London County Council have decided to request the Board of Trade not to accede to the application of the County of London and Brush Provincial Electric Lighting Company for an order authorizing the Company to supply electric light and power in the parishes of Battersea, Camberwell, Lambeth, Newington, and the district of St. Saviour's; their opposition being on the ground that there is ample provision in previous Orders for the electric lighting of the areas scheduled in the proposed Order.

Electric Lighting at Hull.—The Hull Corporation Electric Lighting Committee have had a very successful year's working. According to a report which was submitted to them last Thursday, they sold in 1895 246,277 units of electricity, as against 163,857 units in 1894. The capital had been increased by £6398; and the total expenditure up to the end of the year was £45,429. Last year's revenue was £6522, *plus* banking interest on the past reserve fund; and, after paying all working expenses, there was a balance on the working of £1263, which, had they been a company, would have given a profit of 9 per cent. The number of users had been increased from 271 to 389; and in June last they were able to reduce the price 1d. per unit. The charge is now 5d. per unit; and the Engineer has suggested a reduction to 4d. per unit for motor power. The report was adopted; and it was determined to consider the question of further lowering the price.

GWYNNE & BEALE'S

PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 65,095.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

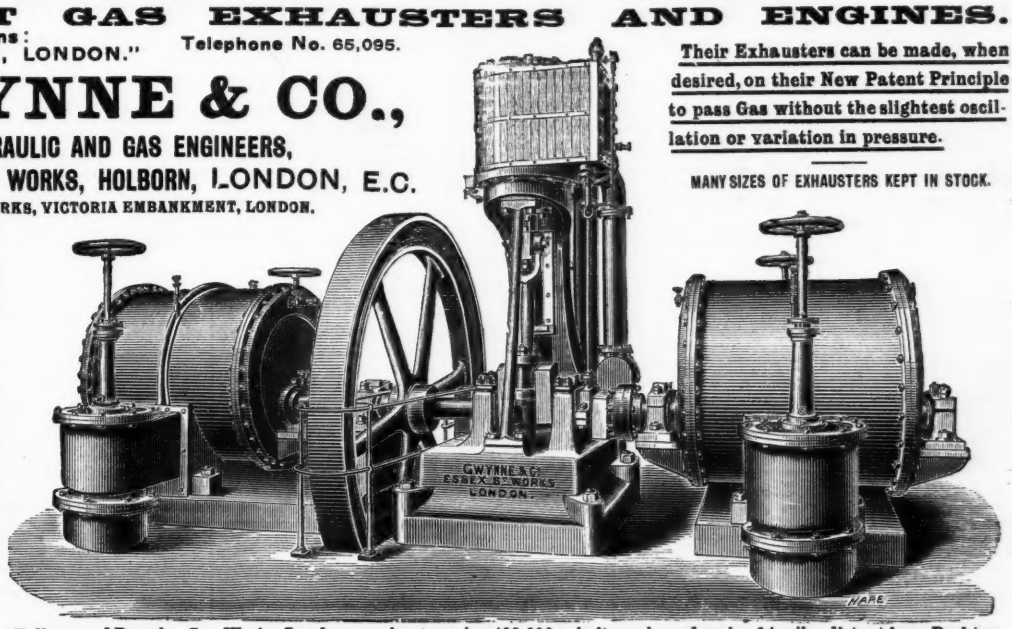
They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.



Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

Catalogues and Testimonials sent on application.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

JOHN WM. O'NEILL, Managing Director, Palmerston Buildings, Old Broad Street, London, E.C.

ANDREW STEPHENSON, AGENT. All communications *re* Oxide to be addressed to Palmerston Buildings.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 300 British Gas-Works

ANDREW STEPHENSON, 382, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.

Telegrams: "Volcanism, London."

W. C. HOLMES & CO., Huddersfield; AND 80, CANNON STREET, LONDON,

Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also Improved Patent Rotary Scrubber-Washers.

*** See Advertisement p. II., centre of JOURNAL.

Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited; Chemical Works, Leeds, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

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OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. Sample and Price on application.

OXIDE PAINTS, OILS, SULPHURIC ACID, &c.

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OXIDE OF IRON.

FINEST Quality of Natural Bog Ore. Particulars and price, apply to Mr. T. L. ARCHER 20, Fennel Street, MANCHESTER.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for, Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and adroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.

Telegraphic Address: "PORTER LINCOLN."

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

AMMONIACAL LIQUOR Wanted.
BROTHERTON AND Co., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR Wanted.
BROTHERTON AND Co., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE Wanted.
BROTHERTON AND Co., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS. Correspondence invited.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c. CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special Attention to Repairs.
Before placing Orders, please write for Estimate.

BACK-PRESSURE IN PURIFIERS.

THE Valve invented by Mr. Cripps for Bye-Passing any Layer of Purifying Material (referred to by the President of the Incorporated Institution of Gas Engineers in his Inaugural Address) can be obtained of the Makers: C. & W. WALKER, Midland Iron-Works, Donnington, near Newport, SALOP, and J. EVERY & SON, Phœnix Iron-Works, LEWES, to which Firms all inquiries should be addressed.

WANTED, a Situation as Fitter's Mate and IMPROVER. Used to Copper Bit and Blowpipe. Been on Automatic Supply Fittings.
Address No. 2629, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

A GENTLEMAN is desirous of obtaining an AGENCY for COAL, CAST-IRON PIPES, or GAS APPARATUS, for the North of England. First-Class References.
Address W. X., care of Street Brothers, 5, SERLE STREET, W.C.

WANTED, a re-engagement as Working MANAGER or MANAGER of Small Works. Thoroughly experienced in Carbonizing, Engines and Exhauster, Main and Service Laying, Fitting up Houses on the Automatic System, and all the General Routine of a Gas-Works. Good Testimonials.
Address W. OWEN, Manager, Horley District Gas Company, Horley, SURREY.

WORKING Manager required for Gas-Works in Midland County. Yearly make about 4½ Millions. Cottage, with Gas and Coal provided.
Apply, stating Age, Experience, and Salary required, and giving References, to the SECRETARY, Gas Company, STONY STRATFORD.

WANTED, for the Elswick Works of the Newcastle-on-Tyne and Gateshead Gas Company, a good DRAUGHTSMAN with experience of Gas-Works Plant, able to take out Quantities accurately, and superintend the erection of work.
Apply, stating Experience and Salary expected, to W. DOIG GIBB, Engineer.

SECRETARY.

APPLICATIONS will be received by the Directors of the Automatic Gas-Meter (1895) Corporation, Limited, from thoroughly competent persons capable of taking full charge of the Books and Accounts of the Company. Must be a thorough Accountant and good Correspondent. Age between 30 and 40 years. Must have some knowledge of Gas Industries.
Applications to be addressed to the Chairman of the Company, 13, Examiner Buildings, Manchester, enclosing *copies* of three recent Testimonials, and stating Salary, and to be sent in on or before the 21st day of February.

WANTED, Offers for 90 and 50 per cent. BENZOLS and NAPHTHAS. Particulars and Samples on Application.
Apply, by letter, to No. 2630, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Advertiser will be glad to communicate with Private Owners of GAS-WORKS and Small Gas Companies who are willing TO SELL OUT FOR CASH. Brief Particulars should be sent in confidence. Works not actually paying at present, but with possible prospects, would be considered on their merits.
Address No. 2616, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SULPHATE OF AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E. and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE. Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

It is Worth Your While to Buy DIRECT.
THE RELIANCE LUBRICATING OIL COMPANY SUPPLY on APPROVAL "RELIANCE" NON-CORROSIVE LUBRICANTS (which, through their superiority, have the largest sale in the world)—viz., Engine, Cylinder, and Machinery Oils, 11½d.; Spindle Oil, 8½d.; Gas-Engine and Dynamo Oils, 1s. 6d. per gallon; Barrels Free and Carriage Paid. Also Liquids for Gas Making, Enriching, &c.
RELIANCE LUBRICATING OIL COMPANY, WATER LANE, GREAT TOWER, LONDON, E.C.
Depôts at Liverpool, Bristol, Hull, Glasgow, and Newcastle-on-Tyne. Telegrams: "Subastral, London."

MOSSLEY CORPORATION GAS-WORKS.

GAS PLANT FOR SALE.

THE Gas Committee have the following PLANT for disposal: Four lengths of D HYDRAULIC MAINS, 36 feet each by 2 ft. 3 in. by 21 in. inside, each length pierced for four sets of 5-inch dips, with six in each set; 96 H-PIPES; 10 ROLLED JOISTS, 20 feet each, for carrying Hydraulic and Foul Mains; BUCKSTAVES; CHANNEL STAYS for fronts of Settings; Steel Blocked RETORT-LIDS, with Handles, Cross-Bars and Screws, Mouthpieces, &c.
The whole of the above will be taken down in a few weeks, and may now be seen at work here.
Any other Particulars may be obtained on application to the Manager, Mr. R. Merrell.
Gas-Works, Mossley,
Jan. 8, 1896.

GAS PLANT, BUILDINGS,
AND
FREEHOLD LAND AT CARSHALTON, SURREY, FOR IMMEDIATE SALE.

THE Croydon Commercial Gas and Coke Company, having discontinued the Manufacture of Gas at their Works in Wrythe Lane, Carshalton, Surrey, have the following GAS PLANT, APPARATUS, BUILDINGS, and FREEHOLD LAND FOR SALE, viz.—

Retort-House and Coal-Store complete, with Wrought-Iron Roofs, six Beds of six Round Fire-Clay Retorts in each, 18 inches diameter by 9 ft. 3 in. long, and three Beds of similar new Retorts and Arches, and three Arches, complete, ready for Retorts.
Hydraulic Mains, Fittings, &c.
Battery Condenser, with 12-inch Valves, Connections, and Bye-Passes.
Horizontal Steam-Engine, Exhauster, and Exhauster Governor, complete.
Washer (Good's Patent), 8 feet diameter, with 12-inch Connections and Valves complete.
Washer, 12-inch, with 6-inch Connections and Valves complete.
Four Purifiers, 12 feet square, with Sieves and 12-inch Connections, Lifting Apparatus and Railway for same, complete.
Station Meter, 10,000 cubic feet per hour, with 12-inch Connections.
Gasholder (Single-Lift), 80 feet by 24 feet, with Brick Tank, Columns, Inlet and Outlet Valves complete, prepared for Telescoping.
Gasholder (Single-Lift), 60 feet by 16 feet, Standards, Brick Tank, &c.
Gasholder, 35 feet by 12 feet, Standards, Brick Tank, &c.
Governor, 6 inches diameter, with 6-inch Valves and Bye-Pass complete.
Governor, 12 inches diameter, with 12-inch Valves and Bye-Pass complete.
Evans Photometer, Clock, Gauges, &c., complete.
Three Large Cast-Iron Water-Tanks (above ground).
Liquor-Tank.
House and Offices, Engine and Boiler House, Meter-House, Lobby and Store-Room, Governor-House and Testing-Room, Purifying House and Shed, Smith's Shop.
Freehold Land, 3 acres, 0 roods, 37 perches (about 2 acres not built upon).

Orders to view the Plant and Works, and Particulars of Prices the Company require for the whole or any portion of the above, can be obtained on application to
W. J. RUSSELL,
Secretary.
Offices: Katharine Street, Croydon,
Jan. 18, 1896.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

THE Undersigned is in a position to supply, at the very lowest Prices, the most suitable kind of BENZOL for enriching Gas, made from Hardman's Patent Carbonization Process, of which I am the Sole Patentee. On application, I would furnish Price on the most reasonable terms; giving advice how to utilize it on the most economical method.
J. HARDMAN, Manufacturing Chemist.
Milton, Staffs.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application to No. 30, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEWBATTLE, DALKEITH, } SCOTLAND.

WIDNES CORPORATION GAS AND WATER WORKS.

GAS PLANT, &c., FOR SALE.

THE Gas and Water Committee have the following PLANT for disposal: ANNULAR CONDENSER, LIVESEY WASHER (each of a capacity of ¾ Million Cubic Feet per diem, and with 12-inch Connections), 12-inch STATION GOVERNOR, ENGINE and EXHAUSTER (capacity, 22,000 Cubic Feet per hour), MANN and WALKER TOWER SCRUBBER 38 ft. by 8 ft., and a WALKER PURIFYING-MACHINE of 1 Million Cubic Feet capacity per diem.
Further Particulars may be obtained on application to Mr. ISAAC CARR, Assoc.M.Inst.C.E., Gas-Works, WIDNES.

LEEDS CORPORATION.

TENDERS FOR FIRE GOODS.

THE Gas Committee of the Leeds Corporation are prepared to receive TENDERS for the supply of FIRE-CLAY RETORTS, FIRE-BRICKS, LUMPS, and FIRE-CLAY.
Particulars as to Quantity, together with Forms of Tender, may be obtained from the undersigned.
Tenders, endorsed "Fire Goods," and addressed to the Chairman of the Gas Committee, Municipal Buildings, Leeds, will be received not later than Wednesday, the 19th inst.
The Committee do not bind themselves to accept the lowest or any tender.
R. H. TOWNSLEY,
General Superintendent.
Municipal Buildings, Leeds,
Feb. 1, 1896.

LEEDS CORPORATION.

TENDERS FOR UNDERGROUND TAR-WELL.

THE Gas Committee of the Leeds Corporation are prepared to receive TENDERS for the excavation and erection of an UNDERGROUND TAR-WELL at the New Wortley Gas-Works.
Plan can be seen, and Specification and Bills of Quantities obtained, on application to Mr. R. Smith, the Manager of the above Works.
Tenders, endorsed "Tar-Well," and addressed to the Chairman of the Gas Committee, Municipal Buildings, Leeds, will be received not later than Monday, the 17th inst.
The Committee do not bind themselves to accept the lowest or any tender.
R. H. TOWNSLEY,
General Superintendent.
Feb. 1, 1896.

PATENTS, DESIGNS, AND TRADE MARKS ACTS, 1883 to 1888.

NOTICE is Hereby Given, that Otto Hermann Steuer, of Dresden, Saxony, German Empire, has applied for LEAVE TO AMEND the SPECIFICATION of the Letters Patent No. 13,066, of 1893, granted to Alfred Julius Boult for "Improvement in, or relating to, the Manufacture of Incandescent Mantles or Filaments for use in connection with Gas or Electric Incandescent Lamps."
Particulars of the proposed Amendments were set forth in the "Illustrated Official Journal (Patents)" issued on the 29th of January, 1896.
Any person or persons may give Notice of Opposition to the Amendment (on Form G) at the Patent Office, 25, Southampton Buildings, London, W.C., within one calendar month from the date of the said Journal.
(Signed) H. READER LACK,
Comtroller General.
BOULT AND WADE,
Chartered Patent Agents,
323, High Holborn, London, W.C.,
and at Nottingham and Sheffield,
Agents for the Applicant.

SOUTH METROPOLITAN GAS COMPANY.

NOTICE is Hereby Given, that an EXTRAORDINARY MEETING of the Proprietors of the South Metropolitan Gas Company will be held at the Bridge House Hotel, London Bridge, in the Borough of Southwark, on Wednesday, the 12th day of February next, at Half-Past Two in the afternoon, or so soon thereafter as the Business of the Ordinary General Meeting shall be concluded, for the purpose of considering the Provisions of a Bill now before Parliament, intituled "A Bill to Convert the Capital of the South Metropolitan Gas Company, and for other Purposes."

At such Meeting, the said Bill will be submitted for the consideration and approval of the Proprietors.

By order,
FRANK BUSH,
Secretary.

Offices: 709A, Old Kent Road, S.E.,
Jan. 24, 1896.

CRYSTAL PALACE DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the "Albion Tavern," Aldersgate Street, London, E.C., on Friday, the 21st day of February, 1896, at three o'clock precisely, to receive the Report of the Directors and statement of Accounts for the Half Year ended the 31st of December last, to declare a Dividend, to elect two Directors and one Auditor retiring by rotation, and for General Purposes.

The TRANSFER BOOKS WILL BE CLOSED from the 6th day of Februar, until after the Meeting.

By order of the Board,
CHARLES M. OHREN,
Secretary.

Offices and Works, Lower Sydenham, S.E.,
Feb. 4, 1896.

WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY.

THE Ordinary General Meeting of the Proprietors of the above Company will be held at the Company's Offices, North Street, Wandsworth, on Tuesday, the 25th of February inst., at Five o'clock in the evening precisely, for the purpose of a declaration of a Dividend, the election of Directors and an Auditor, and the transaction of the General Business of the Company.

THE TRANSFER BOOKS WILL BE CLOSED on and from the 12th until the 25th of February, both days inclusive.

CHAS. W. BRAINE,
Secretary.

North Street, Wandsworth, S.W.,
Feb. 1, 1896.

MITCHAM AND WIMBLEDON DISTRICT GAS-LIGHT COMPANY.

(INCORPORATED BY ACT OF PARLIAMENT, 1867.)

NOTICE is Hereby Given, that the FIFTY-EIGHTH ORDINARY HALF-YEARLY GENERAL MEETING of the Shareholders of this Company will be held in the Board-Room, at the Works, Mitcham, in the County of Surrey, on Tuesday, the 18th day of February, 1896, at Three o'clock in the Afternoon precisely, to receive the Report of the Directors and a Statement of the Accounts for the Half Year ended the 31st day of December last, to declare a Dividend, to elect Directors and an Auditor in place of those retiring by rotation, and for General Business.

The TRANSFER BOOKS WILL BE CLOSED from the 3rd inst. until after the Meeting.

By order,
BENJAMIN GREEN,
Secretary and Manager.

Offices and Works: Western Road,
Mitcham, Feb. 1, 1896.

COLNEY HATCH GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, New Southgate, on Thursday, the 13th of February next, at Five o'clock in the Evening precisely, to receive the Report of the Directors, and the Accounts of the Company for the Half Year ended the 31st of December, 1895; to declare Dividends; to elect Directors; to appoint an Auditor; and for other purposes.

By order,
ERNEST L. BURTON,
Secretary.

Jan. 28, 1896.

STOCKS AND SHARES IN THOROUGHLY SOUND, WELL-ESTABLISHED DIVIDEND-PAYING COMPANIES.

J. A. & W. THARP will Sell by Auction at the Mart, E.C., on Thursday, Feb. 6, at Two o'clock, SHARES in—

The Lea Bridge, Leyton, and Walthamstow Tramways Company.
The Patent Victoria Stone Company, Limited.
The London General Omnibus Company, Limited.
The National Safe Deposit Company, Limited.
The Commercial Gas Company.
The West Ham Gas Company.
The Romford Gas Company.
And also
London Bridge Water-Works Annuities (payable by the New River Company).

Particulars of the AUCTIONEERS, 9, Norton Folgate, BISHOPSGATE STREET, E.C. Telephone No. 11,342.

Price 5s. per 100.

THE USE OF

GAS LIME IN AGRICULTURE.

By Dr. A. VOELCKER.

A 4pp. Leaflet for Distribution among Farmers and others.

LONDON: Walter King, 11, Bolt Court, Fleet St., E.C.

REPORTS OF GAS ASSOCIATIONS

— UNITED KINGDOM —

THIRTEENTH YEAR.

Will be ready next week, Price 5s. 6d. each, Post Free,

THE COMPLETE REPORTS

OF PROCEEDINGS OF THE

DISTRICT ASSOCIATIONS of GAS MANAGERS FOR 1895.

The Twelve previous Volumes (for 1883 to 1894) are still on Sale. Price 5s. 6d. each, post free.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to Mr. E. PRICE, Inventor and Patentee, 119, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.

ARMSTRONG'S

PATENT

CANDLE SAFETY LAMPS.

Are a great improvement on Oil, giving a good Light, requiring little or no Cleaning, and when once lighted no further attention is necessary. The Candles are made to burn 5, 7, or 9 hours.

43, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

JUNKERS' CALORIMETER

SHOWS AT A GLANCE THE HEATING VALUE OF GAS.

NO BOMB. NO ANALYSIS.

See Illustrated Advertisement in the "JOURNAL" for Jan. 21, p. 147.

Reduced Price £15 15s.

Orders booked in rotation.

HERMANN KÜHNE,
25-35, New Broad Street, London, E.C.

LOW MOOR BLACK BED

GAS COAL.

YIELD OF GAS PER TON	10,375 CUBIC FEET.
ILLUMINATING POWER	17·50 SPERM CANDLES.
COKE	75 PER CENT.

Prices, f.o.r. or f.o.b., on application to

GEORGE & JOHN HAIGH,
RAVENS LODGE AND CONYERS' COLLIERIES,
DEWSBURY.

A TRIAL IS RESPECTFULLY SOLICITED.

ESTABLISHED 1862.

TRADE MARK.

NEW GAS PLANT CEMENT

For all Joints in connection with

SULPHATE PLANT. OIL-GAS PLANT. GAS. TAR. AMMONIA.

SAMPLES ON APPLICATION.

SPECIAL PAINTS FOR GAS-WORKS.

Telegrams "Enamel." Nat. Tel. 1759.

John E. Williams & Co., *Victoria Paint Works,* **Manchester.**

THE DRUM

FOR PUMPING AIR, WATER, SEMI-FLUIDS, &c.

See Advertisement in last and next issue.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

Following the acquisition of new Works situated in the heart of the cheapest Coal, Iron, and Steel Districts, we have added to our Technical Staff the

MOST SUCCESSFUL MODERN EXPERTS

in the designing of

AUTOMATIC

COAL & COKE HANDLING PLANTS

WE EARNESTLY WISH ENGINEERS TO INSPECT OUR LATEST DESIGNS.

New CONVEYOR Co., Ld.,

3 & 4, Lime Street Square, London, E.C.

HOLMSIDE GAS COALS.

PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation.

Yield of Gas Per Ton . . 11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton . . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . 13½ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash. . . . . 1·34 Per Cent.
Tar. . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COAL-FIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED.

WARNING.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED.

WHEREAS, it has been brought to the notice of the INCANDESCENT GAS-LIGHT COMPANY, LIMITED, that divers Firms upon the Continent of Europe are Manufacturing Incandescent Gas-Mantles, and are sending the same into this Country, and are issuing Advertisements offering to forward the same carriage paid into this Country, or to deliver the same to the Purchasers at various places on the Continent, and are also advertising in this Country for Agents to push the sale of these Mantles.

THIS IS TO GIVE NOTICE, that all such Mantles are Infringements of the Company's Patent, and that the Company will take proceedings for Infringement against all persons purchasing or using any of such Incandescent Gas Mantles. The Company own the Master Patents in this Country for the manufacture of Incandescent Gas Mantles, and the validity of such Patents has already been certified by the Honourable Mr. Justice Romer, and the Company will enforce their Patent Rights against all Infringers.

FAITHFULL & OWEN,
Solicitors for the Incandescent Gas-Light Company, Limited.
11, Victoria Street, Westminster.

TO ENGINEERS & MANAGERS.

ESTABLISHED OVER 50 YEARS.

This is to certify that I, SAMUEL NELSON, am the only ORIGINAL MAKER of the SOLID LEAD SATURATOR, or the CASED SATURATOR.

All Estimates given free for Lead Chemical Burning, and also Contracts for Sulphate Saturators.

Note Address—

20, SPRING GARDENS, BOLTON, Lancashire.

Please write for Estimate before ordering elsewhere.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton .	10,500	Cubic Feet.
Illuminating Power .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY, LIMITED,

Newcastle-on-Tyne.

W. H. PARKINSON, FITTER.

NOTICE.

Whereas it has come to the knowledge of the INCANDESCENT GAS-LIGHT COMPANY, Limited, of Palmer Street, Westminster, that a Company called the Meteor Incandescent Gas-Light Company, Limited, a firm known as Putz and Co., and a Company known as the Evening Sunlight Incandescent Light Company are selling, and are offering for sale, forms of Incandescent Gas-Lights called respectively the "Meteor," the "Champion," and the "Evening Sunlight."

THIS IS TO GIVE NOTICE, THAT THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED, will commence ACTIONS FOR INFRINGEMENTS of their Patents against all persons found dealing in any manner with the said "Meteor," "Champion," or "Evening Sunlight" Incandescent Gas-Lights, which are all constructed in Infringement of the Patent of the Incandescent Gas-Light Company, Limited.

The validity of the Company's Patent has been certified by the Hon. Mr. Justice Romer.

FAITHFULL & OWEN,
11, Victoria Street, S.W.
Solicitors for the Incandescent Gas-Light Company, Limited.

NOTICE.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED, Hereby Give Notice, that they only supply their Mantles subject to the following express Conditions, which are printed and pasted on each box:—

"The Incandescent Gas-Light Company, Limited, in supplying the Mantle contained in this box, grant a Limited License to the purchaser to sell or use the same on the express condition that neither the purchaser nor any other person into whose hands the same may come shall use or sell the said Mantle except in connection, or for use, with Burners sold or supplied by the Company; any other sale or use will amount to Infringement of the Company's Patents. The Company supply Mantles for the purpose of renewals at the nominal price of 1s. 3d., subject to the Conditions and Limitations above set forth."

In the case of *The Incandescent Gas-Light Company, Limited v. Cantelo*, Mr. Justice Wills upheld the Validity of these Conditions and Limited License; and, in the course of his Judgment, said:—

The patentee has the sole right of using and selling the articles; and he may prevent anybody from dealing with them at all. Inasmuch as he has the right to prevent people from using them or dealing in them at all, he has the right to do the lesser thing—that is to say, to impose his own conditions. It does not matter how unreasonable or how absurd the conditions are. It does not matter what they are if he says at the time when the purchaser proposes to buy, or the person proposes to take a license: 'Mind I only give you this license on this condition;' and the purchaser is free to leave it or take it as he likes. If he takes it, he must be bound by the condition."

In the case of *The Incandescent Gas-Light Company v. Hirschfeld and Others*, the Honourable Mr. Justice Romer certified that the Validity of the Plaintiffs' Patents was established. Infringers in future will be liable to costs as between Solicitor and Client.

(Signed) FAITHFULL & OWEN,
Solicitors for the Incandescent Gas-Light Company, Limited.

NOTICE.

The attention of the METEOR INCANDESCENT LIGHTING COMPANY, LIMITED, having been again called to the Advertisements inserted in various papers by the Incandescent Gas-Light Company, Limited, of Palmer Street, Westminster, to the effect that the "Meteor" Incandescent Gas-Lights are an Infringement of their Patents, and that they will bring Actions for Infringement against all persons found dealing in any manner with such Lights, the METEOR INCANDESCENT LIGHTING COMPANY, LIMITED, HEREBY GIVE NOTICE that they are advised that the "Meteor" Incandescent Lights in no way infringe any of the Patents of the Incandescent Gas-Light Company, Limited, that an Action has been commenced to restrain such threats, and that they are PREPARED TO FULLY INDEMNIFY ALL PURCHASERS, DEALERS, AGENTS, and USERS of their Lights against any Legal Proceedings on the part of the Incandescent Gas-Light Company, Limited.

WILSON, BRISTOWS, & CARPMAEL,
1, Copthall Buildings, London, E.C.,
Solicitors to the Meteor Incandescent Lighting Company, Limited, of 35, New Broad Street, London, E.C.

Nov. 30, 1895.

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JOHN CLARKSON MAJOR,

(Established 1851,)

Tar Distiller and Manufacturing Chemist,

WOLVERHAMPTON.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.,
8 Lombard Street,
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W. RICHARDSON, Fitter.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
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THORNLEY GAS COALS

WORKED BY THE
WEARDALE IRON & COAL Co., Ld.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton . .	10,500 Cub. Ft.
Illuminating Power . .	16·9 Candles.
Coke (of good quality) . .	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the
WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
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Prices and Analysis of all the Scotch Cannels on Application.

LONDONDERRY GAS COALS

FROM THE
MARQUIS OF LONDONDERRY'S COLLIERIES,
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Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO
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SHEAF WORKS, SHEFFIELD,
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FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS,
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

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Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

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TYNE
BOGHEAD CANNEL.

Yield of Gas per ton . . . . . 13,155 cub. ft.
Illuminating Power . . . . . 38·22 candles.
Coke per ton . . . . . 1,301·88 lbs.

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Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles
Coke . . . . . 73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
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PURIFIERS, SCRUBBERS, CONDENSERS, WASHERS, TANKS, VALVES,
PIPES, LAMP PILLARS, RETORT-FITTINGS, ETC.

ALSO ALL KINDS OF
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AND STEEL WORK.
BRIDGES,
ROOFS,
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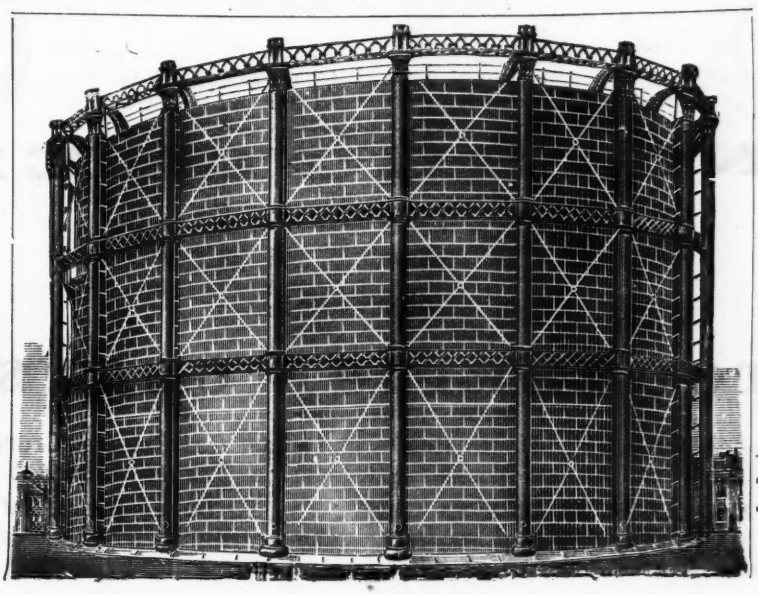

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FIRE-CLAY & BRICK WORKS,
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Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
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Shipments Promptly and Carefully Executed.
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Gas Companies are solicited to try Samples of the
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BLACK BED GAS COAL.
Prices and Analysis on application.
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RAVENSTHORPE, near DEWSBURY.

HUNTER'S
OXIDE OF IRON.
James Hunter, Miner, and Shipper of NATURAL IRISH BOG ORE.
This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.
Samples and Prices on application.
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Telegrams: "Hunter, Port Glasgow."
Established 1872.

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Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.
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Telegraphic Address: "WIGAN BIRMINGHAM." Telephone No. 200.
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ALSO SILVER MEDAL, PARIS.
The Highest Award for Gas-Retorts and other Goods in Fire-Clay has been awarded to KING BROTHERS for their Goods made from their renowned Stourbridge Fire-Clay.

KING BROTHERS,

Proprietors of
STOURBRIDGE CLAYS,
Manufacturers of
Fire-Bricks, Tank Blocks, Glass-House Bricks and Pots, Gas-Retorts, Crucibles in Clay and Plumbago, Gas-Oven Bricks, Bricks for Regenerator Furnaces and Hot-Air Stoves.
STOURBRIDGE, ENGLAND.
CRUCIBLE MANUFACTORY, 46, PENN STREET, CURZON STREET, BIRMINGHAM.
N.B.—Gas, Blast-Furnace, and Glass-House Bricks and Glass-House Pots always in Stock, or made on the Shortest Notice.

"LOFTUS"
PATENT STREET-LANTERNS

100 PER CENT. MORE LIGHT CAN BE OBTAINED FROM ANY FLAME BY USING THIS LANTERN INSTEAD OF THOSE NOW USED.

PUBLIC BODIES, CORPORATIONS, AND GAS COMPANIES CAN SAVE 50 PER CENT. BY USING THIS LANTERN FOR STREET LIGHTING.

Can be fitted for OIL where required.

No. 420 G.

FIRST COST LITTLE MORE THAN ORDINARY LANTERNS.

Exceedingly Brilliant Light in direction of Lenses, Lights Footway all along between Lamps.

For Further Particulars, inquire for PRICE LIST "L" from

THE SUNLIGHT & SAFETY LAMP CO., LTD.

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Telegraphic Address: "PROGRESS, BIRMINGHAM." A.B.C. Code used.

Or from London Agent: J. JONAS, 38, Lime Street, E.C., where a Specimen Lamp can be seen.

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GAS ENGINEERING CONTRACTORS,

EXETER,

For **GASHOLDERS** and all kinds of **ENGINEERING APPARATUS.**

For **WET** and **DRY GAS CONSUMERS' METERS.**

For **COIN METERS,** their Patent Automatic is admitted to be one of the best and most reliable in the Market. Largely used in the Metropolis.

For **GAS-FITTINGS,** Registered Designs in Extensive Variety.

Manufacturers of the **LIVESEY WASHER.**

Agents for the **MAXIM CARBURETTOR.**

New Works, 5 acres in extent, recently opened in the City of Exeter for the Manufacture of every kind of Apparatus used in the Production, Distribution, and Sale of Gas.

Telephone 132. **Telegraphic Address: "Willey, Exeter."**

ESTABLISHED 30 YEARS.

MASON'S GAS-PRODUCER

[PATENT 7467-93.]

This System is the "**only**" one which works **CONTINUOUSLY**. There are no Clinkers formed, consequently a constant and regular volume of gas is maintained. Labour is **considerably reduced**, one man being able to attend to **8 PRODUCERS**. Clinkering being dispensed with, there is a saving in Fuel of quite **10 PER CENT**. A bright clear gas is obtained from **COKE BREEZE**, which can be used for heating **RETORT-BENCHES**, and every description of **FURNACE** and **KILN**.

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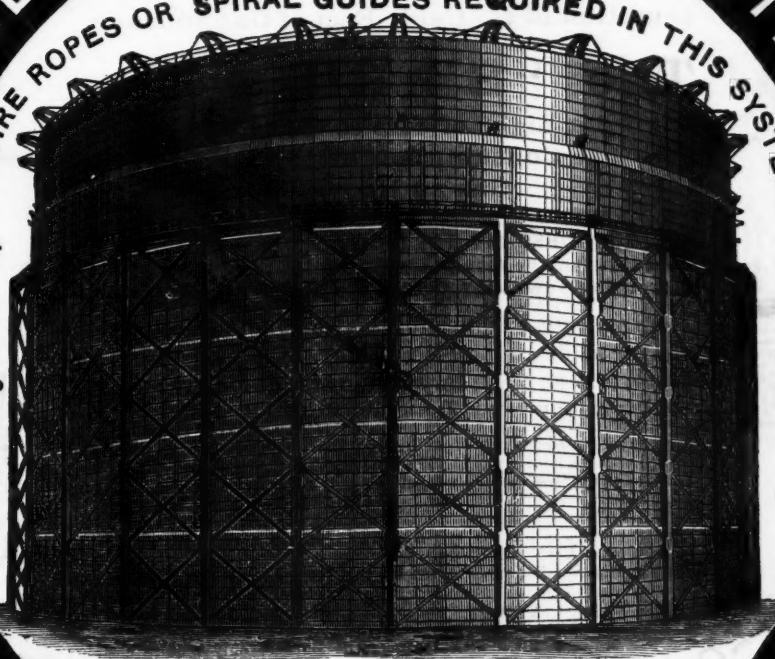
THE LARGEST GASHOLDER IN THE WORLD

GASHOLDERS OUR SPECIALITY

NO WIRE ROPES OR SPIRAL GUIDES REQUIRED IN THIS SYSTEM.



INFINITELY SAFER AND FAR LESS COSTLY THAN ROPES OR SPIRAL GUIDES.

CAPACITY 12 MILLION CUBIC FT.

ERECTED AT EAST GREENWICH FOR THE South Metropolitan Gas Company

IT HAS SIX LIFTS 30 FT. DEEP EACH AND IS 300 FT. DIAR.

MAKERS OF GAS PLANT OF EVERY DESCRIPTION

ROOFS PURIFIERS &c. ALSO

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GASHOLDERS OF ANY SIZE

ERECTED & COMPLETED WITHIN 12 MONTHS AND AT THE TIME SPECIFIED

IMPROVEMENTS IN STREET LIGHTING.
HIGHEST EFFICIENCY WITH GREATEST ECONOMY.

LIGHTING AUTHORITIES, GAS ENGINEERS, & GAS MANAGERS

Are invited to inspect the

INCANDESCENT GAS-LIGHT

Which has now been successfully adapted to the purposes of

STREET LIGHTING,

THE DIFFICULTIES CAUSED BY VIBRATION HAVING BEEN OVERCOME BY THE USE OF A SPECIAL BURNER, WHICH GIVES HIGHLY SATISFACTORY RESULTS.

This System of Lighting meets the Requirements of all the Lighting Authorities in those Districts where it is desired to effect an Improvement in Street Lighting, without any increase of expenditure.

Two forms of Burners are specially recommended for Street Lighting:—

The "C" BURNER,

Giving a Light of 60 Candles, with a Consumption of 3½ Cubic Feet of Gas an Hour.

The "S" BURNER,

Giving a Light of 25 to 30 Candles, with a Consumption of 2¼ Feet of Gas an Hour.

The INCANDESCENT GAS-LIGHT has been tried with most satisfactory results for Street Lighting purposes in many Towns throughout the United Kingdom.

The Lighting Engineer of the Kensington Vestry, in a report dated the 14th of May, 1895, addressed the Works and Sanitary Committee as follows:—

(1) During the months of January, February, and March, 1895, 31 Incandescent Gas-Lamps were in use for an average period of 1167·89 hours. The estimated quantity of gas that would have been consumed by the 10-feet flat-flame burner was 11,678 cubic feet. The actual quantity of gas used by the Incandescent Gas-Light Company's Burners, as recorded by the meters, was 4415 cubic feet.
After allowing for the extra cost of up-keep, the gain to the Vestry by the use of these burners was £20 3s. 4½d., and a large increase in the Illumination of the Street.

(2) The illuminating power given by the Incandescent Gas-Burners, consuming 3·78 cubic feet of gas per hour, was found to be equal to 60 candles. That given by the flat-flame burners, consuming 10 cubic feet of gas per hour, was 26 candles.
The lanterns fitted with Incandescent Burners only require cleaning 9 times in 90 days, as compared with 26 times' cleaning in the same period required by the lanterns fitted with flat-flame burners.

The net result therefore appears to be that, by the use of the Incandescent Gas-Light System, the saving effected is 15s. per lamp for this quarter, after paying for the up-keep of the Burner, and at the same time more than double the light is obtained. It must be noted, however, that these results were obtained with the ordinary burners, and not with the improved burners with the anti-vibration springs. With the latter, the expense of up-keep would be materially reduced, and the saving consequently increased.

For further Particulars, apply to

THE INCANDESCENT GAS-LIGHT COMPANY, LTD.,

PALMER STREET, WESTMINSTER, LONDON, S.W.

ALEX. C. HUMPHREYS, M.Inst.C.E. A. G. GLASGOW, M.E.

MESSRS. HUMPHREYS & GLASGOW

Have constructed their EUROPEAN type of

CARBURETTED WATER-GAS PLANT

At the following Gas-Works:—

Copenhagen	700,000 Cub. Ft.	Brussels	700,000 Cub. Ft.
Belfast	1,700,000 ,,	Liverpool	2,500,000 ,,
Glasgow	300,000 ,,	Tottenham	600,000 ,,
Santiago	400,000 ,,	Brighton	1,250,000 ,,
Swansea	700,000 ,,	Bath	1,000,000 ,,

And have now under Contract:—

Belfast (Second Contract)	3,500,000 Cub. Ft.	Manchester	3,000,000 Cub. Ft.
Preston	1,500,000 ,,	New York	1,000,000 ,,
Southport	750,000 ,,	Newburgh, N.Y.	350,000 ,,
Tottenham (Second Contract)	750,000 ,,	St. Joseph, Mo.	750,000 ,,

In addition to which the previous Installations of The Gaslight and Coke Company under this System have a total capacity of 10,000,000 cubic feet per diem.

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JOHN BROWN & CO., LTD., SHEFFIELD,

Proprietors of

ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
Telegrams: "ATLAS SHEFFIELD."

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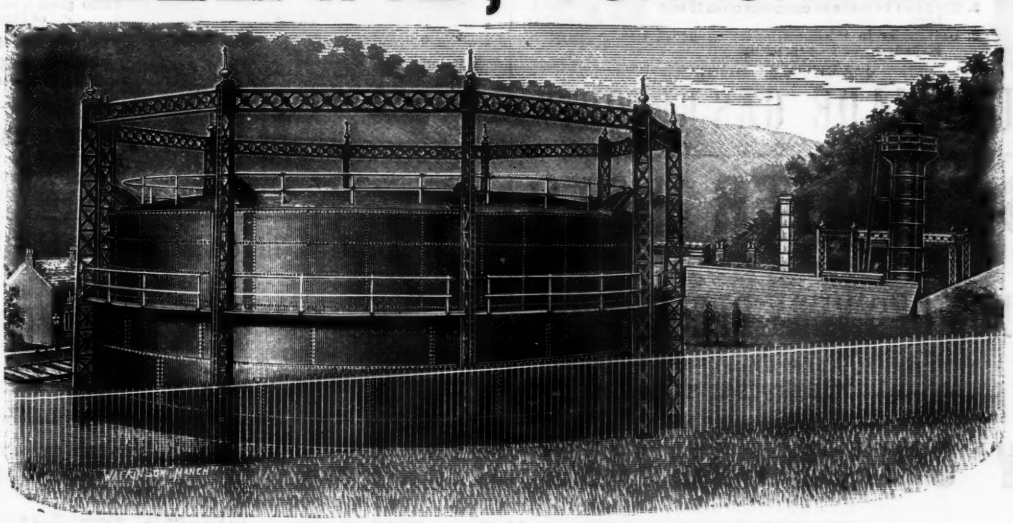
ELLAND, YORKSHIRE.



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GASHOLDERS & TANKS

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W. E. SANDER,
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SPECIALITIES: Incandescent Lamp Burners and Mantles (with or without electric lighting from any distance, by button from the wall, etc.).

INCANDESCENT SPIRIT LAMPS.
Electro-technical Ware of all kinds.
IMPORT and EXPORT.

OSLER,
BIRMINGHAM.
MANUFACTURERS
OF GASELIERS
IN GLASS AND METAL.

WILLIAM INGHAM & SONS,
Incorporated with the Leeds Fire-Clay Company, Ltd.,
WORTLEY FIRE-CLAY WORKS,
Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—
1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT
MACHINE-MADE GAS-RETORTS.

GAS AND WATER PIPES
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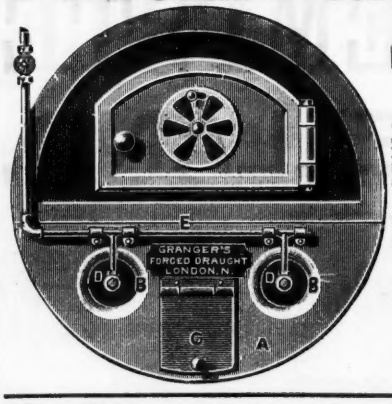

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